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TINCTURE OF OPIUM (LAUDANUM).

By Marie O. Glover, A.M., S.B.

Having had occasion to collect and assay samples of tincture of opium from eight of the principal wholesale drug houses of New York, and an equal number of retail drug stores in Boston, it was thought that the results obtained might, perhaps, be interesting, as representing in some degree the strength of this preparation now in the market.

The change in the strength of opium preparations recently made in accordance with the U. S. Pharmacopœia of 1880 would lead us to expect a greater variation than usual just at this time, although it might be supposed that samples made according to the old standard would bear upon the label some indication of the fact. This was, however, not found to be the case, as the only labels giving any information in regard to morphia strength were those from wholesale houses, which stated that the laudanum was made according to the U. S. P., 1880, or, in two instances, that it contained 6 grains to the fluidounce.

The method of assay employed was that of Flückiger, modified by E. R. Squibb ("Ephemeris," Vol. I, No. 1, p. 14; "Amer. Jour. Phar.," 1882, p. 244), and it was found necessary to introduce a slight modification of this process, in order to obtain clean, light-colored morphia.

The tincture was measured in every case at 15·6°C. (60°F.), 50 cc. being the amount used in each assay; the weight was also taken. It was then evaporated to 10 grams, 2·5 cc. of alcohol were added, and the mixture stirred, to obtain a uniform solution. This was in most cases impossible, therefore the mixture was poured gradually and with constant stirring into 100 cc. of alcohol, and the beaker covered and set aside until the supernatant fluid had become perfectly clear. The clear fluid was then decanted through a filter, the precipitate washed

with alcohol, and the filtrate and washings evaporated until the alcohol was expelled, a little water being added. When the contents of the dish again weighed 10 grams, 2·5 cc. of alcohol were added, and a uniform solution was generally obtained. This was transferred to a small flask with as little additional water as possible, 2·5 cc. more alcohol added, and the flask well shaken. There were now 15 cc. of stronger ether added, the shaking repeated, and lastly 2 cc. of ammonia water (10 p. c. NH_3) were added, and the whole shaken until the crystals began to separate, the shaking after this being frequently repeated for half an hour. After standing over night the ethereal stratum was carefully poured off on to a filter, 10 cc. more ether added, and the contents of the flask rinsed around without shaking. When the ethereal layer had separated, it was poured off through the filter, and the latter washed with 5 cc. of ether, carefully dropped on to the edges from a pipette, and allowed to dry. The remaining contents of the flask were poured on, the flask and filter washed, using in all only about 10 cc. of wash water. The filter and contents were then dried at 100°C. (212°F.), weighed, the morphia removed, and the weight of the filter taken and subtracted. The result was then calculated to grains to a fluidounce.

The samples were treated as nearly as possible alike, the quantities of ether, alcohol and ammonia being the same, and the time allowed for precipitation about 24 hours in all cases. It was found impossible to assay most of them successfully without the alcoholic precipitation, the morphia obtained being dark-colored and impure, and in 3 out of 4 samples where comparative tests were made, *less* in amount, the gummy matter separated by the alcohol apparently hindering the precipitation.

The U. S. P. process, as given by Henry B. Parsons, in his interesting report, read before the New York State Pharmaceutical Association ("Weekly Drug News and Am. Pharmacist," June 23, 1883) was tried with 4 of the samples, the results being always lower, by a varying amount (from ·2 to ·8 grain to the fluidounce), than those obtained by the other process. It appears also that weighing the morphia on balanced filters, when the U. S. P. process is employed, gives a higher result than that obtained by subtracting the weight of the filter on removing the morphia. As the crystals are remarkably clean and easy to remove, the latter would seem to be the more correct method. The increase in weight may possibly be due to the formation of $CaCO_3$ to a greater extent in the pores of the inner filter, which is more exposed to the air during filtration.

The results obtained are as follows:

No.	Per cent. of Morphia.	Grains of Morphia to the Fluidounce.
1	1·20	5·24
2	1·20	5·25
3	0·91	3·95
4	0·59	2·62
5	0·66	2·89
6	1·40	6·06
7	0·86	3·81
8	1·24	5·46
9	0·77	3·32
10	0·98	4·29
11	1·10	4·77
12	0·65	2·87
13	0·75	3·29
14	1·24	5·45
[15	1·31	5·70]
16	1·27	5·59
17	1·33	5·87

The morphia from each sample was tested for its solubility in lime water ("Ephemeris," Vol. I, No. 1, p. 18), and in Nos. 8, 10, 11 and 16, which showed a large amount of insoluble matter (the others containing traces merely), a correction was made for this, the amount being determined by collecting the insoluble substance (narcotine?) from about 0·5 gram on a balanced filter, drying and weighing. The use here of the balanced filter cannot well be avoided, as the precipitate is of such a nature that it would not be possible to remove it, but it is open to the same objection as above, and the amount of impurity thus found is doubtless somewhat high. Before making the reduction the figures stood: No. 8, 5·63 grains, No. 10, 4·44 grains, No. 11, 4·89 grains, No. 16, 5·72 grains, to the fluidounce.

Nos. 1, 2, 6, 8, 14, 16 and 17 are all probably intended to answer the requirements of the U. S. P., 1880. A sample of laudanum (No. 15) made from 15 per cent. opium, according to the U. S. P., substituting 40 parts each of alcohol and water for 4 as directed, yielded, after making the subtraction for impurities insoluble in lime water, only 5·70 grains to the fluidounce, 6·03 being the amount obtained before correction.

Nos. 3, 7, 10 and 11 would fulfil the requirements of the U. S. P., 1870, according to which the minimum strength would be 3·75 grains to the fluidounce. Nos. 9 and 13 are perhaps intended to conform to this.

Nos. 4, 5 and 12 agree neither with the old strength nor with the new, but come within the limits (2·3 to 3·3 grains to the fluidounce) assigned by Mr. Parsons to laudanums probably made from moist opium.

Thus, of the 16 samples of tincture of opium we have 7 answering nearly or quite the requirements of the U. S. P., 1880, 4 meeting those of the U. S. P., 1870, 2 somewhat below this standard, and 3 containing such a small percentage of morphia that they are open to the suspicion of having been intentionally made of low morphia strength.

In every case, however, where the label contained the letters U. S. P., or the statement that the laudanum was made according to the U. S. P., 1880, it was found to contain between 5 and 6 grains of morphia to the fluidounce.

The number of samples is not large, and they were obtained only from New York and Boston, therefore it is hardly safe to draw general conclusions from the assays; but as these samples were received in June, 1883, at least seven months later than those assayed by Mr. Parsons, and after sufficient time had elapsed for the new standard to be adopted, it may, perhaps, not be quite useless to give the results.

Laboratory of Dr. E. R. Squibb,
Brooklyn, N. Y., August 31, 1883.

EXTRACT OF MALT.

By J. U. Lloyd.

Read at the Sixth Session of the Thirty-first Annual Meeting of the American Pharmaceutical Association.

When substances of this kind were introduced some five years ago, we were induced by the demand created to make a preparation of malt. In looking at the matter it then seemed to us that the desideratum was a pharmaceutical one which should embody the soluble constituents of well malted barley. We therefore arrived at the conclusion that there was little if any necessity for a deviation from the regular line of fluid extracts, although the process for making malt extract in Germany resulted in a substance of the consistence of thick honey. Our view of the subject has not been changed. The most practical and feasible process for extracting the desirable principles from malt in our opinion is that of percolation. The product repre-

sents all of the valuable constituents of malt if the menstruum is adapted to their extraction. The finished fluid extract is pleasant to the taste; it is rich in diastase.

The action of malt on warm gelatinous starch, whereby the starch is quickly changed into dextrin and sugar, has been familiar since malt liquors have been used. Payen and Persoz (1833) first gave us the name *diastase*, which they applied to the fermentation principle of germinating malt. This substance is also found in other germinating seeds, sprouting potatoes, etc. This diastase is now generally accepted as the desirable principle of malt, although the glucose certainly is useful as a food, and to us it is by no means certain that other substances than diastase are not present and valuable.

Extract of malt, as introduced into this country, and which, as far as we can learn, was first officinal in the German Pharmacopœia, was made by bringing a decoction of malt to the boiling point, and then evaporating it to the consistence of a thick extract. Such in substance was the process, and the appearance and characteristics of the preparations sold originally in our country under this name induces us to believe that they were then made in his manner. Until one year ago we do not know that in this country particular attention had been directed to the comparison of values of malt extracts in accordance with their powers to convert gelatinized starch into dextrin and glucose. The perishable nature of diastase was well understood, and yet the makers of malt extracts seemed scarcely to consider it as a prominent factor.

An extract of malt made a few years ago, which was preserved by us in an original bottle, compared with one of recent date made by the same manufacturer, show a great difference in appearance and in properties. This preparation is that of one of the largest manufacturers. We have every reason to believe that the makers endeavor to produce an unexceptionable preparation, and we feel assured that they were as likely as any to have been among the first to consider the value of diastase. Hence it is that we may well believe Mr. Cowdrey to have first directed prominent attention in this country to the ease with which an *extract of malt* may be dispossessed of its diastase. In his paper read before the Association at its last meeting he stated that a temperature of boiling completely destroyed it. This statement has since been supported by our experiments and by those of others. It is true, also, that a temperature of from 160° Fah. to 180° Fah. will destroy dias-

tase in a very short time, and any continued application of heat at or above 130° Fah. will within a moderate period render it inactive. Hence it is that we now doubt the advisability of applying any heat to a preparation of malt, and we certainly have every reason to believe that pharmacists generally will always be debarred through want of proper facilities from preparing an active malt extract unless it be as a fluid extract.

In the paper of Mr. Cowdrey, and as illustrated by his experiments, it was stated and shown that 4 drachms of a viscid-like extract of malt could quickly convert into dextrin and glucose 5 drachms of starch which had been boiled with water.[1] This conversion of gelatinous starch into glucose we have also easily accomplished by means of an equal bulk of fluid extract of malt, although we do not claim that it is desirable to introduce a process into the Pharmacopœia to represent a proportion of crude material to finished product different from that of the other fluid extracts. It is for the purpose of suggesting a formula for making such a preparation (fluid extract of malt) that we have written this paper, for in the literature which we have at our command on this subject, although the fact is shown that heat will destroy diastase, and that an extract can be made to contain diastase, any reference to the method of preparing such an extract is omitted.

To prepare a fluid extract of malt which will represent as nearly as practical one part of malt to one part of the finished product we have recently followed the process adopted by us with some other substances which will not bear the application of heat. Tall cylindrical percolators should be used, and a menstruum composed of a mixture of one part of alcohol to four parts of water.[2] The ground malt is moistened with this menstruum, and after one hour is packed carefully into the percolator, and not too firmly. The remainder of the menstruum is then added, and when the percolate appears the exit is closed and maceration conducted for twenty-four hours. Then the percolate is slowly withdrawn until it is equal in weight to three-fourths the amount of malt employed. This product is placed in a tall vessel,

[1] Mr. Cowdrey only exhibited such an extract. He did not give the process by which it was made.

[2] We have found during our experiments that if less amount of alcohol is used, occasional fermentation follows. Hence it is that we suggest the above-named proportion.

permitted to settle, and then decanted. This decanted liquid is the finished fluid extract.

The specimen which we now exhibit was prepared after this process.

In presenting this paper we trust that we will not be considered as participants in the malt controversy which has more or less agitated the pharmacists of some sections of our country during the past year. The substances offered as far as we know under the name of malt extracts, and which our Pharmacopœia recognizes as a malt extract, are entirely different in appearance from the preparation to which we refer. Our object is simply to bring before the Association a process which can be used by pharmacists with limited conveniences. Any process embodying the application of heat which we have investigated tends, according to our late experiments, to destroy the diastase, and when, by evaporation at a gentle heat, the viscid-like extract is obtained, it will generally be found that, as far as the diastase is concerned, it is in less amount, bulk for bulk, than in the liquid before evaporation, even if it be not altogether wanting. Hence it is that we believe the simple proces of percolation is best adapted to the wants of pharmacists generally, and we think such should be the officinal process for making malt extract.

PETROLATUM IN THE OFFICINAL OINTMENTS.

By Joseph P. Remington.

Read at the Sixth Session of the Thirty-first Annual Meeting of the American Pharmaceutical Association.

Petrolatum, the new officinal ointment base, was probably the subject of more animated discussion in the long series of debates occurring in the last Committee of Revision and Publication of the Pharmacopœia, than any other preparation. The fact that it was a mixture, being composed of hydrocarbons, of the paraffin and olefin series probably ranging from $C_{16}H_{34}$ to $C_{32}H_{66}$ and from $C_{16}H_{32}$ to $C_{27}H_{54}$, and that its physical properties depended to a considerable extent upon the relative proportion of olefin constituents, contributed to the necessity for thorough study and discussion; but the need that was recognized for a non-oxidizable substitute for lard, and the conviction that the cosmolines, vaselines, deodorolines, saxolines, petrolines, etc., in their then condition of varying composition, would not be acceptable in a national authority, was the prime reason for fixing a standard which

could be readily reached and would be essentially practical. After prolonged consideration, it was finally decided to fix the melting point but slightly above that of the best form of the commercial article, for experience had shown that excellent results had been obtained therapeutically from a petrolatum having a melting point of 40°C. (or 104°F.), and a firmer petrolatum could be readily produced by incorporating yellow wax with it, although care is necessary in the production of this firmer ointment. To insure a homogeneous compound it must be stirred thoroughly and continuously after it has commenced to congeal, whilst upon the large scale mechanical stirrers are recommended. At the present time petrolatum can be had of excellent quality and fully up to the requirements of the Pharmacopœia, in large quantities cheaper than good lard, and the reduction in price due to competition is still going on, and thus one practical obstacle to its general employment in ointments is overcome. It is not the intention of this paper to enter into a discussion of the therapeutical superiority of petrolatum as a base for ointments; its very extensive use in this connection, by physicians, compelled the Committee of Revision to introduce it into the Pharmacopœia; and if at the time of the decision an adequate supply, made by different manufacturers and not proprietary in its character, could have been assured it would have probably been directed in the formulas for the ointments. The next revision will, in all probability, require its use in most of the officinal ointments. With the view of obtaining some experience in its general use, the following series of formulas was devised, in which petrolatum is substituted for lard or other animal fat in each one of the officinal cerates and ointments, and one-pound samples are herewith submitted to the Association for inspection; the formulas will be accompanied by comments when deemed necessary.

CERATUM.—*Cerate.*—Yellow wax, thirty parts; petrolatum, seventy parts. Melt them together and stir constantly until cool. The cerate made in this way is of a light yellow color and, of course, would not be recognized as officinal simple cerate; it is nevertheless an excellent dressing, and will retain its properties unimpaired a greater length of time than officinal cerate.

CERATUM CAMPHORÆ. — *Camphor Cerate.* — Camphor liniment, three parts; olive oil, twelve parts; cerate (made with petrolatum), eighty-five parts. Mix the camphor liniment and the olive oil and incorporate with the cerate. This cerate was introduced as the base of

cerate of sub-acetate of lead, and when made from petrolatum is more permanent than the officinal. A better and simpler formula, in some respects, is as follows: Powdered camphor, one part; petrolatum, ten parts; cerate (made from petrolatum), one hundred and eighty-nine parts. Warm the petrolatum until it liquefies, then dissolve the camphor in it and incorporate with the cerate.

CERATUM CANTHARIDIS.—*Cantharides Cerate.*—Cantharides, in No. 60 powder, thirty-five parts; yellow wax, twenty parts; resin, twenty parts; petrolatum, twenty-five parts. Use the officinal process.

CERATUM CETACEI.—*Spermaceti Cerate.*—Spermaceti, ten parts; yellow wax, twenty-five parts; petrolatum, sixty-five parts. Melt together the spermaceti and wax, then add the petrolatum and stir the mixture constantly until cool. Not white, but much more permanent than the officinal.

CERATUM EXTRACTI CANTHARIDIS.—*Cerate of Extract of Cantharides.*—Cantharides, in No. 60 powder, thirty parts; resin, fifteen parts; yellow wax, thirty-five parts; petrolatum, thirty-five parts; alcohol, a sufficient quantity. Use the officinal process.

CERATUM PLUMBI SUBACETATIS.—*Goulard's Cerate.*—Solution of subacetate of lead, twenty parts; camphor cerate (made from petrolatum), eighty parts. Mix them thoroughly. This cerate is more permanent than the officinal and, in practice, will be found to be very efficient in alleviating acute, active, cutaneous inflammation, at times being successful when the officinal ointment does not afford immediate relief. It is yellowish-white in color.

CERATUM RESINÆ.—*Resin Cerate.*—Resin, thirty-five parts; yellow wax, fifteen parts; petrolatum, fifty parts. Melt together at a moderate heat, strain through muslin, and allow it to cool without stirring. The substitution of petrolatum in this cerate is probably not much of an improvement from a therapeutic point of view, as stimulation is the object sought; it would however not be objectionable. When made without stirring, a semi-translucent handsome ointment is produced.

CERATUM SABINÆ.—*Savine Cerate.*—Fluid extract of savine, twenty-five parts; resin cerate (made from petrolatum), ninety parts. Use the officinal process.

UNGUENTUM.—*Ointment.*—Petrolatum, eighty parts; yellow wax, twenty parts. Melt the wax and add the petrolatum gradually, then stir the mixture constantly until cool. A yellowish-white ointment,

which is firmer in consistence than the petrolatum, having the higher melting-point. It is well adapted for use in the firmer class of medicated ointments.

UNGUENTUM ACIDI CARBOLICI.—*Ointment of Carbolic Acid.*—Carbolic acid, ten parts; ointment (made from petrolatum), ninety parts. Mix them thoroughly. This ointment seems to have less tendency to separate than that made by the officinal process; therapeutically there can be but little difference in them.

UNGUENTUM ACIDI GALLICI.—*Ointment of Gallic Acid.*—Gallic acid, ten parts; benzoinated petrolatum, ninety parts. Use the officinal process. Very little benefit was observed when petrolatum was treated with benzoin; the peculiar change in the odor of petrolatum which occurs when it is long kept has been observed in benzoinated petrolatum almost to as great an extent as in simple petrolatum which was exposed for the same length of time. The odor is undoubtedly modified by the presence of the benzoin, but the petrolatum is not changed or protected by it. This ointment is undoubtedly an improvement on the officinal one.

UNGUENTUM ACIDI TANNICI.—*Ointment of Tannic Acid.*—Tannic acid, ten parts; benzoinated petrolatum, ninety parts. Use the officinal process. This is a better ointment, therapeutically, than the officinal.

UNGUENTUM AQUÆ ROSÆ.—*Cold Cream.*—Petrolatum, sixty parts; white wax, ten parts; rose water, thirty parts. Use the officinal process. The addition of a small quantity of oil of rose improves this ointment greatly. Although it would be probably useless to attempt to dispense this improved ointment, in ordinary counter practice, as cold cream, because of its yellowish color, there is no question of the superiority of the petrolatum cold cream as a practical dressing and emollient.

UNGUENTUM BELLADONNÆ. — *Belladonna Ointment.*— Alcoholic extract of belladonna, ten parts; diluted alcohol, six parts; petrolatum, eighty-four parts. Rub the extract with the diluted alcohol until uniformly soft, gradually add the petrolatum and mix thoroughly. An improvement over the officinal ointment therapeutically.

UNGUENTUM CHRYSAROBINI.—*Chrysarobin Ointment.*—Chrysarobin ten parts, petrolatum ninety parts. Rub the chrysarobin with the petrolatum, gradually added, until they are thoroughly mixed. A

better ointment may be made, however, by digesting the mixture in a water-bath and stirring thoroughly as it cools.

UNGUENTUM DIACHYLON.—*Diachylon Ointment.*—Lead plaster sixty parts, petrolatum thirty-nine parts, oil of lavender one part; melt together the lead plaster and petrolatum at a moderate heat; then, having permitted the mass to become partly cool, incorporate with it the oil of lavender, and stir constantly until cold. This ointment is a decided improvement on the officinal formula, it keeps much better, does not separate, and is not so adhesive. On account of the want of uniformity in the quality of olive oil permitted by the Pharmacopœia, physicians often complain of the irritant effects produced by the use of this ointment as ordinarily dispensed. The use of petrolatum would undoubtedly do away with these difficulties, and a smooth, non-irritating and more permanent ointment than the officinal be produced.

UNGUENTUM GALLÆ.—*Nutgall Ointment.*—Nutgall in No. 80 powder ten parts, petrolatum ninety parts. Rub the nutgall, with the petrolatum, gradually added, until they are thoroughly mixed. For therapeutical reasons this is preferable to the officinal.

UNGUENTUM HYDRARGYRI.—*Mercurial Ointment.*—Mercury four hundred and fifty parts, petrolatum three hundred parts, yellow wax one hundred and fifty parts, compound tincture of benzoin forty parts, mercurial ointment one hundred parts. Mix the mercury with the tincture of benzoin in a mortar, add the mercurial ointment (which should contain fifty per cent. of mercury); and triturate the mixture until globules of mercury cease to be visible; then add the petrolatum and yellow wax, previously melted together and partially cooled, and continue the trituration until globules of mercury cease to be visible under a magnifying power of ten diameters. This is believed to be a better ointment than the officinal, for both lard and suet are dispensed with, the necessary firmness being imparted by yellow wax; the process is practically more rapid than the officinal because suet is almost granular in its character, and prolonged trituration is necessary to break down the granules; the disagreeable odor always present in suet, is of course absent in the improved preparation, whilst rancidity is effectually prevented.

UNGUENTUM HYDRARGYRI AMMONIATI.—*Ointment of ammoniated Mercury.*—Ammoniated mercury, in very fine powder, ten parts, petrolatum ninety parts. Rub the ammoniated mercury with the petro-

latum, gradually added, until they are thoroughly mixed. Preferred for therapeutical reasons.

UNGUENTUM HYDRARGYRI NITRATIS.—*Citrine Ointment.*—The practice which has been indulged in to some extent of making citrine ointment from petrolatum is one which should be condemned. The well-recognized therapeutic effects caused by the use of this ointment are probably due not only to the presence of the acid nitrate of mercury, but to the elaïdin produced by the action of nitric acid upon olein. Now it has been shown by Schorlemmer that hot nitric acid attacks octane, one of the higher members of the paraffin group, and that succinic acid is one of the products, but it is yet to be proved that the resulting compounds, if any, produced by reacting upon petrolatum with nitric acid, under the circumstances detailed by the officinal process are valuable. Indeed, it is very probable that the chemical changes are slight, and it is very fair to assume, that totally different products must result when a mixture of paraffins is treated with nitric acid than when the olein in an animal oil is so treated.

Practical results seem to verify this view, for the attempts to produce ointment of nitrate of mercury from petrolatum, which have been made by various investigators from time to time, have proved failures, a spongy yellowish mass, filled with bubbles of gases resulting from decomposition, and ultimately turning brown, is the result. The present officinal process, if strictly adhered to, gives an excellent product, and, for the reasons above given, the writer recommends it in preference to all others.

UNGUENTUM HYDRARGYRI OXIDI FLAVI.—*Ointment of Yellow Oxide of Mercury.*—Yellow oxide of mercury, in very fine powder, ten parts; ointment (made from petrolatum; see unguentum) ninety parts. Rub the oxide of mercury with the ointment, gradually added until they are thoroughly mixed. Preferred to the officinal from therapeutical reasons.

UNGUENTUM HYDRARGYRI OXIDI RUBRI.—*Ointment of Red Oxide of Mercury.*—Red oxide of mercury, in very fine powder, ten parts; ointment (made from petrolatum; see unguentum), ninety parts. Rub the oxide of mercury with a small quantity of the ointment until a perfectly smooth mixture is obtained; then gradually add the remainder of the ointment, and mix thoroughly. More permanent than the officinal, and preferable therapeutically.

UNGUENTUM IODI.—*Iodine Ointment.*—Iodine, four parts; iodide

of potassium, one part; water, two parts; petrolatum, ninety-three parts; use the officinal process. A dark greenish black ointment is produced, which is probably not inferior to the officinal. The advantages of the use of petrolatum here are not so apparent as in some of the other ointments.

UNGUENTUM IODOFORMI.—*Iodoform Ointment.*—Iodoform, in very fine powder, ten parts; petrolatum, ninety parts. Rub the iodoform with the petrolatum, gradually added until they are thoroughly mixed. Preferable on therapeutic grounds.

UNGUENTUM MEZEREI.—*Mezereum Ointment.*—Fluid extract of mezereum, twenty-five parts; petrolatum, eighty parts; yellow wax, twelve parts. Melt together the petrolatum and wax with a moderate heat, add the fluid extract, and stir the mixture constantly until the alcohol has evaporated, then continue to stir until cool. The advantages of petrolatum in this ointment over lard are not very apparent, as it is used as a stimulating application.

UNGUENTUM PICIS LIQUIDÆ.—*Tar Ointment.*—The use of petrolatum here is not recommended, although, if desirable, a mixture of yellow wax and petrolatum of the consistence of suet could be used.

UNGUENTUM PLUMBI CARBONATIS.—*Ointment of Carbonate of Lead.*—Carbonate of lead, in very fine powder, ten parts; petrolatum, ninety parts. Rub the carbonate of lead with the petrolatum, gradually added until they are thoroughly mixed. Preferable therapeutically to the officinal.

UNGUENTUM PLUMBI IODIDI.—*Ointment of Iodide of Lead.*—Iodide of lead, in very fine powder, ten parts; petrolatum, ninety parts. Rub the iodide of lead with the petrolatum gradually added until they are thoroughly mixed. A bright orange-colored ointment, which darkens on the surface when exposed.

UNGUENTUM POTASSII IODIDI.—*Ointment of Iodide of Potassium.*—Iodide of potassium, in fine powder, twelve parts; hyposulphite of sodium, one part; boiling water, six parts; petrolatum, eighty-one parts. Dissolve the iodide of potassium and the hyposulphite of sodium in the boiling water in a warm mortar; then gradually add the petrolatum and mix thoroughly. This ointment is of a lemon yellow color, but shows a disposition to separate on keeping due to the presence of the water; it should only be made as it is needed.

UNGUENTUM STRAMONII.—*Stramonium Ointment.*—Extract of Stramonium, ten parts; water, five parts; petrolatum, eighty-five parts.

Rub the extract with the water until uniformly soft, then gradually add the petrolatum and mix thoroughly. Very much preferable to the officinal, in the treatment of hemorrhoids.

UNGUENTUM SULPHURIS.—*Sulphur Ointment.*—Sublimed sulphur, thirty parts; petrolatum, seventy parts. Rub the sulphur with the petrolatum, gradually added until they are thoroughly mixed. Probably no better than the officinal.

UNGUENTUM SULPHURIS ALKALINUM.—*Alkaline Sulphur Ointment.*—Washed sulphur, twenty parts; carbonate of potassium, ten parts; water, five parts; petrolatum, sixty-five parts. Rub the sulphur with the carbonate of potassium and the water, gradually add the petrolatum, and mix thoroughly. Preferable on therapeutic grounds, to the officinal.

UNGUENTUM VERATRINÆ.—*Veratrine Ointment.*—Veratrine, four parts; alcohol, six parts; petrolatum, ninety-six parts. Rub the veratrine with the alcohol in a warm mortar until dissolved, then gradually add the petrolatum and mix thoroughly, This ointment is much darker in color than the ointment formerly officinal, due to the complete solution of the veratrine. When made from petrolatum it is probably more efficient than when made from lard, because of its more rapid absorption.

UNGUENTUM ZINCI OXIDI.—*Ointment of Oxide of Zinc.*—Oxide of Zinc, twenty parts; petrolatum, eighty parts. Rub the oxide of zinc with twenty parts of petrolatum previously melted, until the mixture is perfectly smooth then add the remainder of the petrolatum and mix thoroughly. This ointment does not equal the officinal in appearance; it is not white nor does it have the pleasant balsamic odor due to the benzoin, but when used to allay irritation, as in acute eczema, the ointment made from petrolatum will frequently be preferred.

COMPARISON OF GALENICAL PREPARATIONS OF THE UNITED STATES AND GERMAN PHARMACOPŒIAS.

BY THE EDITOR.

(Continued from page 444.)

Mistura Amygdalæ, U. S.—Sweet almond 6 parts, sugar 3 parts, acacia 1 part, distilled water 100 parts. *U. S.*—The German Pharmacopœia has only a general formula (see Emulsiones seminales, February number, page 80) according to which almond mixture is made of sweet almond 10 parts and distilled water 100 parts.

Mucilago Acaciæ, U. S. Mucilago Gummi arabici, *P. G.*—Gum arabic washed with cold water 34 parts *U. S.*, 33 parts *P. G.*, dissolve in water 66 parts.

Oleoresina Aspidii, U. S. Extractum Filicis, *P. G.*—Displace male fern 100 parts with stronger ether until 150 parts of percolate are obtained; distil and evaporate until free from ether. *U. S.*—Macerate for 3 days male fern 5 parts with ether 15 parts; decant, and again macerate with ether 10 parts; express, filter and evaporate. The extract stirred and diluted with glycerin should not show any starch granules when examined under the microscope. *P. G.*

Oleoresina Cubebæ, U. S. Extractum Cubebarum, *P. G.*—Displace cubeb 100 parts with stronger ether until 150 parts are obtained; distil and evaporate until free from ether; set aside and decant from the waxy and crystalline matter. *U. S.*—Macerate for 3 days cubeb 10 parts with a mixture of ether (spec. grav. 726) and alcohol each 15 parts and express; again macerate with alcohol and ether each 10 parts and express; filter and evaporate. Before dispensing shake well. *P. G.*

Pilulæ Aloes et Ferri, U. S. Pilulæ aloëticæ ferratæ, *P. G.*—Purified aloes, dried sulphate of iron and aromatic powder of each 6·50 gm. (100 gr.); confection of rose sufficient; make 100 pills, *U. S.*—Dried sulphate of iron and aloes, of each equal parts; alcohol sufficient; make pills each weighing 0·1 gm.; by means of tincture of aloes make them glossy and black. *P. G.*—The pills contain ·065 gm., *U. S.*, ·050 gm., *P. G.*, of each aloes and exsiccated ferrous sulphate.

Potassa sulphurata, U. S. Kalium sulfuratum, *P. G.*—The processes of the two pharmacopœias are practically identical. The potassium carbonate used contains at least 81 per cent. *U. S.*, 89·7 per. cent. *P. G.*, of pure potassium carbonate; two parts of it mixed with 1 part of sulphur are fused in a crucible *U. S.*, in an iron or earthen vessel *P. G.*, and the melted mass poured on a marble slab *U. S.*, into an iron mortar or an iron slab. *P. G.*

Pulvis effervescens compositus, U. S. Pulvis aërophorus laxans, *P. G.*—Each powder in blue paper contains 2.583 gm., *U. S.*, 2.5 gm., *P. G.*, of sodium bicarbonate and 7·75 gm. *U. S.*, 7·5 gm. *P. G.*, of Rochelle salt. The white powders contain 2·25 gm. *U. S.*, 2·0 gm. *P. G.* of tartaric acid.

Pulvis Glycyrrhizæ compositus, U. S. Pulvis liquiritæ compositus, *P. G.*—Senna 18, glycyrrhiza 16, fennel 8, washed sulphur 8, sugar

50 parts *U. S.* Senna 18, glycyrrhiza 18, fennel 9, washed sulphur 9, sugar 54 parts *P. G.*

Pulvis Ipecacuanhæ et Opii, U. S. Pulvis Ipecacuanhæ opiatus, *P. G.*—Identical, except that the opium used must contain between 12 and 16 per cent. *U. S.*, not less than 10 per cent. *P. G.*, of morphine.

Pulvis Rhei compositus, U. S. Pulvis Magnesiæ cum Rheo P. *G.*—Rhubarb 25, magnesia 65 and ginger 10 parts. U. S.—Rhubarb 15, magnesium carbonate 60, and oil sugar of fennel 40 parts. *P. G.*

Resina Jalapæ, U. S., P. G.—The processes are identical, except that jalap root is exhausted by percolation *U. S.*, or by maceration *P. G.*—The test of the U. S. Pharmacopœia, that the portion of the resin insoluble in ether, should be dissolved by potassa solution and not precipitated by an acid, is correct. But the next test which is also that of the German Pharmacopœia is incorrect; it requires that 1 part of the resin be soluble in 50 parts (5 parts, *P. G.*, which is not quite sufficient) of warm ammonia water, that this solution on cooling do not gelatinize (absence of colophony) and on being supersaturated with an acid, remain clear. This last requirement is correct only for that portion which is insoluble in ether, but not for the small portion soluble in ether.

Resina Podophylli, U. S. Podophyllinum, *P. G.*—The German Pharmacopœia gives no process, but merely a description and tests. Among the latter may be mentioned, that the preparation on being agitated with cold water and filtered, yields a colorless bitter liquid, which is without action on litmus paper, is colored brown by ferric chloride and becomes opalescent with subacetate of lead, depositing after some hours, reddish-yellow floccules.

Sodii carbonas exsiccatus, U. S. Natrium carbonicum siccum, *P. G.*—The processes are identical, except that the crystallized sodium carbonate is allowed to effloresce by exposure to warm air, *U. S.*, or at a temperature not exceeding 25°C. (77°F.), *P. G.*, and afterwards dried to one-half its original at a temperature of about 45°C. (113°F.), *U. S.*, or between 40° and 50°C. (104° and 122°F.), *P. G.*

Spiritus Ætheris, U. S. Spiritus æthereus, *P. G.*—Æther spec. grav. ·750, 30 parts, alcohol 70 parts, *U. S.*—Æther spec. grav. ·726, 1 part, alcohol 3 parts, *P. G.*—The percentage of absolute ether in both preparations is very nearly alike.

Spiritus Ætheris nitrosi, U. S., P. G.—Mix sulphuric acid 7 parts with alcohol 31 parts, add nitric acid 9 parts, and distil at or below

82°C. (180°F.); pour the distillate into 16 parts of ice-cold water, separate the ether and mix it with 19 times its weight of alcohol. Spec. grav. ·823–·825; contains at least 4 per cent. of ethyl nitrite, *U. S.*—Add nitric acid (spec. grav, 1·185) 12 parts, to alcohol 48 parts, after 12 hours distil 40 parts, neutralize with magnesia, and after 24 hours rectify from a water-bath. Spec. grav. ·840–·850. If 3 drops of normal potassa solution be added to 10 gm. of the spirit, the mixture should not have an acid reaction. *P. G.*

Spiritus Camphoræ, U. S. Spiritus camphoratus, *P. G.*—Identical.

Spiritus Juniperi, U. S., P. G.—Oil of juniper 3 parts, alcohol 97 parts. *U. S.*—Juniper berries 5 parts, alcohol and water each 15 parts; after 24 hours distil 20 parts. *P. G.*

Spiritus Lavandulæ, U. S., P. G.—Make like the preceding from oil of lavender 3 parts and alcohol 97 parts, *U. S.*; lavender flowers 5 parts, alcohol and water each 15 parts, *P. G.*

Spiritus Menthæ piperitæ, U. S., P. G.—Identical, except that 100 parts are colored green by 1 part of peppermint, *U. S.*, while the peppermint spirit of the *P. G.* remains uncolored.

ON THE QUALITY OF COMMERCIAL IODIDE OF POTASSIUM.

By Albert B. Prescott.

[Read at the Third Session of the Thirty-first Annual Meeting of the American Pharmaceutical Association.]

Query 16.—*Will Iodide of Potassium of foreign and of home manufacture answer the tests of the Pharmacopœia? Which averages best?*

I am indebted to the Chairman of the Committee on Queries for the *five* samples I have examined, each of which came to me in an unbroken pound package, bearing the label of the manufacturer. *Three* of the samples were of American and *two* of European production. Of the latter, the one was British and the other was German. In sending the samples, Professor Lloyd called my attention to the fact that the European samples represented articles usually classed as "fine," or "chemically pure" goods, and sold at a price much higher than that of the American articles. Upon the manufacturers' labels, the American and British samples bore, with well-known names, no claim or specification as to the degree of purity, or grade of use, of the articles, but the German sample had the familiar inscription, "Ph.

Germ." From the labels, then, it is to be understood that all the articles represented in these samples were put forth, alike for medicinal use—the ordinary use of iodide of potassium—and without claim for any higher degree of purity than medicinal uses (or pharmacopœial specifications) require. The price-lists of the German makers of pure chemicals for analytical and special purposes, usually give two grades of "Kalium iodatum," namely: "Ph. Germ," and "*puriss.*," the latter article being priced only three or four per cent. higher than the former. It is true that the article professing to be merely German pharmacopœial iodide of potassium is frequently furnished and used, in this country, as a "chemically pure" salt for analytical purposes. And from occasional trials of both these German grades, during the past six or eight years, I can only say that the article marked "*purissimum*" is somewhat more likely to be fit for all uses of a chemical reagent than the article marked "*Ph. German.*," while even the former is often defective. Under the imprint "*puriss.*" I have less often found an alkaline reaction, or the presence of iodate, but have frequently found chloride and not rarely bromide. An article trustworthy as a reagent in all uses, can only be obtained, already made, out of these grades, by selection of lots, upon special order. And cheaper grades than either of these are to some extent available for analytical uses, by careful selection, it being not very uncommon to find a lot of American medicinal iodide of potassium that is at once neutral in reaction, and free from appreciable traces of iodate, chloride, bromide and sulphate. In view of their cost in this country, it may well be claimed that the European articles represented in these samples are not in the market upon the same plane with the American articles.[1] Nevertheless we have to note that these European grades are made for medicinal use in Europe.

The Query concerns only conformity to the test-limits of the Pharmacopœia. Our standard of measurement is the United States Phar-

[1] With present import duties it appears that the cost of the European goods under consideration is about 100 per cent. greater than that of the American goods, each being carried in the same quantities. Sold as special goods upon small demand, the European articles cost from 130 to 150 per cent. more than the American. In a late instance known to the writer, iodide of potassium warranted chemically pure for use in analysis, and admissible to the country free of duty for scientific purposes, was obtained by importation at a rate thirty-three per cent. higher than the rate for the standard medicinal salt of American manufacture.

macopœia. Primarily we are to apply the tests of the U. S. Ph., 1880, and, in the way of further inquiries, secondarily, we may compare tests of the U. S. Ph. of 1870, the current Br. Ph., and the new Ph. Germ. Also, we may consult unofficial tests for their bearing upon Pharmacopœial standards, and may ask discussion as to the right province of these standards.

The Pharmacopœial requirements are taken in order as follows, believed to be the order of their importance:

(1) *The absence of iodate.*—"The aqueous solution of the salt, mixed with gelatinized starch and afterward with diluted sulphuric acid, should not at once acquire a blue color (absence of iodate)," U. S. Ph., 1880. "Its solution, mixed with diluted sulphuric acid, and afterwards with solution of starch, gradually assumes a purple tint, which at length becomes blue. When tartaric acid is freely added to a strong solution, . . . the supernatant liquid, if mixed with solution of starch, gradually assumes a purple tint, which at length becomes blue," U. S. Ph., 1870. "The addition of tartaric acid and mucilage of starch to its watery solution does not develop a blue color," Br. Ph. The watery solution (1 to 20), . . . mixed with diluted sulphuric acid, on the addition of solution of starch, should not at once become blue, Ph. Germ. (1882) The test is often made by adding a crystal of tartaric acid to the solution of the iodide to be tested. The results by a crystal of tartaric do not differ materially from those by dilute sulphuric acid (provided the latter be quite free from nitrous acid). In doubt as to the purity of the sulphuric acid at hand, the tartaric acid crystal may well be used. The test by color of the liquid without starch is but little less delicate, though not quite sufficient for the law. Of course the result hinges on the occurrence of the color "at once," and in the Ph. Germ. test the acid is added with or immediately before the starch. Pure hydriodic acid, it will be remembered, exposed to air, and in water containing air, very soon gives free iodine. All oxysalts of iodine, hypoiodite[1] as well as iodate, are revealed by the test, and are fairly excluded by the requirement of the Pharmacopœia. Practically the test is a close one, but does not effect an absolute exclusion of iodate, when no regard is given to slight tints of the starch short of the "blue color." Moreover, the test should not be applied in very dilute solu-

[1] It has been inferred that traces of salt of hypoiodous acid sometimes result from atmospheric liberation of hydriodic acid, and impart a peculiar odor, corresponding to that of the chlorinated compounds.

tions. The German Pharmacopœia prudently specifies the strength of the solution (1 to 20). Biltz[1] found that in solution of 1 to 20, the addition of dilute sulphuric acid, without starch, gave a pale yellow color when only 0·1 to 0·01 per cent. of iodate was present, while in much more dilute solutions as large a quantity as 0·5 per cent. could be present before a full brown color was developed on addition of the acid. Iodate of potassium is well known to be poisonous. Most reducing agents, including many organic bodies, liberate iodine from an iodate, and with help of an iodide all acids at once cause, as in the test, the liberation of iodine in amount six times that in the iodate.[2] Even atmospheric carbonic acid gradually effects this change. And 1 part of potassium iodate, with excess of iodide and with free acids, furnishes 3·5 parts of free iodine. Free iodine, as an impurity in the salt in hand, or as a product in the stomach, is alike objectionable. In one method of manufacture of iodide of potassium, iodate is formed and afterward reduced. Also, pure iodide, exposed for an hour to melting heat, acquires a trace of iodate and an alkaline reaction. Manufacturers are not likely to be so careless as to neglect due reduction of iodate when this is a considerable intermediate product of their process, but they may neglect needful precautions, or additional work, to remove final traces of this impurity, especially when only such traces are formed in the method employed. When potassium iodide is manufactured free from iodate, I do not believe this impurity is ever acquired by atmospheric action in keeping, even if in solution. The pure salt is not affected by the air when dry, and when moist is affected no further than a possible, very slight liberation of hydriodic acid, and then of free iodine, with corresponding formation and preservation of alkali carbonate.

(2.) *The Limit of Alkalinity.*—" . . . Generally . . . having a faintly alkaline reaction; but single crystals laid upon moistened red litmus paper should not at once produce a violet-blue stain (absence of more than about 0.1 per cent. of alkali)," U. S. Ph., 1880. " Produces no change in the color of litmus, and little if any in that of turmeric," U. S. Ph., 1870. " It commonly has a feeble alkaline reaction. . . . Its aqueous solution is only faintly precipitated by the addition of saccharated solution of lime," Br. Ph. Crystals laid upon moistened red litmus paper should not immediately give a violet-blue color, Ph.

[1] Notizen zur Pharmacopœa Germanica (1878), p. 181.

[2] $5KI + KIO_3 + 6HCl = 6I + 6KCl + 3H_2O$.

Germ., 1882. Giving a neutral or very slightly alkaline solution, not made turbid by lime-water, Ph. Germ., 1872. Biltz found that $\frac{1}{8}$ per cent. of potassium carbonate would cause a violet-blue color to show at once on placing a crystal upon wet litmus paper, while $\frac{1}{2}$ per cent. would give a pure blue color at once, and 1 per cent. a deep blue color at once. Also that the lime-water test does not reveal less than 1 per cent. of the alkali carbonate, when the solution is concentrated, and even more than 1 per cent. will escape recognition when the solution is dilute. It is an easy task to determine the percentage of alkali volumetrically. In so doing I prefer to weigh out 6·9 grammes of the iodide to be tested, and use decinormal solutions of acid and alkali, when each cc. of decinormal acid (beyond that taken up by the decinormal alkali) equals 0·1 per cent. of potassium carbonate. Excess of the acid is first added, from the burette, when the solution is quickly brought to boiling, and immediately titrated back to neutral point with the decinormal alkali. With phenol-phthalein as an indicator, the number of cc. of acid required to take out the red color in presence of bicarbonate formed will be about one-half the number of cc. of acid required to keep the reaction acid after driving off the carbon dioxide. It may be assumed that, unless in some exceptional case, the alkali found is alkali monocarbonate. Some degree of alkaline reaction is a pretty general feature of medicinal iodide of potassium, all over the world, and is accepted, and now more definitely limited by the pharmacopœias. Alkali in fraction of 1 per cent. probably will not be objected to by the physicians. But it must be admitted that any alkali at all is liable to be an inconvenient pharmaceutical imcompatibility. Nearly all iodide of potassium offered as "chemically pure" is neutral in reaction, whatever its other defects. A neutral iodide, free from iodate, if kept moderately air-dry, will not acquire free iodine from atmospheric action.

(3.) *The Limit of Chloride and Bromide.*—If 1 gm. of the salt be dissolved in 10 cc. of water of ammonia (of 10 per cent), then skaken with a solution of 1·1 gm. of nitrate of silver in 20 cc. of water, and the filtrate be super-saturated with 7 cc. of nitric acid (s. g. 1·42), no cloudiness should make its appearance within ten minutes (absence of more than than 0·5 per cent. of chloride or bromide)" U. S. Ph., 1880. "Solution of nitrate of silver added in excess forms a yellowish-white precipitate which, when agitated with ammonia, yields by subsidence a clear liquid in which excess of nitric acid causes no turbidity," Br.

Ph. The test required by the German Pharmacopœia of 1882, is that of our present pharmacopœia, with all quantities just one-fifth as large, but with dilution to over twice as great proportional volume, while the time is the same, and the limit is at opacity instead cloudiness. The German test, therefore, is a little less stringent than ours. The various tests depending upon weight of silver precipitate obtained, or quantity of silver nitrate required for precipitation, or volume of a standard mercuric solution for reaction, all require very close operations, upon the perfectly dried salt, and their results are worthless if there be more than one impurity or defect present. The effect of alkali carbonate counterbalances that of chloride or of sodium salt. Traces of chloride and bromide are very difficult to avoid in manufacture. A quantity of chloride, larger than the limit, renders the article deliquescent in proportion to its increase. But our present limit will no doubt be found close enough. The test-limit admits more of bromide than chloride, but cannot admit enough of bromide to pass by proportions of intentional adulteration with this cheaper salt. If it be desired to test for bromide, the iodine may be precipitated by copper sulphate, with a little ferrous sulphate or sulphurous acid, and the filtrate treated with excess of dilute fresh chlorine water (enough to oxidize any remaining iodide to iodic acid), when the test may be completed by shaking with carbon disulphide, or chloroform, for the yellow color of bromine.

(4.) *Limit of Sulphate.*—"On adding to 1 gm. of the salt, dissolved in 30 cc. of water, five or six drops of test solution of nitrate of barium, no immediate cloudiness or precipitate should make its appearance (limit of sulphate)," U. S. Ph., 1880. 20 cc. of a watery solution (1 to 20), with ten drops of barium nitrate solution, should not become turbid in five minutes, Ph. Germ., 1882. If the salt have been found alkaline, a drop or two of hydrochloric acid is to be added.

(5.) *Test for Cyanide.*—The solution (1 to 20), with a fragment of sulphate of iron, and a few drops of ferric chloride solution, warmed, with addition of solution of soda, should not give a blue color on supersaturating with hydrochloric acid, Ph. Germ., 1882. A possible impurity carried through the manufacture from the iodine.

(6.) *Test for Sodium Salt.*—The U. S. Ph. and the Br. Ph., only demand identification as potassium salt, by precipitation of the tartrate. The German Pharmacopœia specifies that the flame color shall be violet at first, a quite severe requirement, but one sometimes justified by articles in commerce.

(7.) *Test for Moisture.*—Drying to a constant weight at 100°C.

(8.) *Test for Free Iodine.*—The salt will be colored. A solution shaken in a test-tube with carbon disulphide, or chloroform, will impart the violet color to the subsiding layer.

(9.) *Test for Nitrate.* Precipitate with excess of silver sulphate solution, and test the filtrate with concentrated sulphuric acid and a crystal of ferrous sulphate, for nitric acid. Adulteration with entire crystals of sodium nitrate has been noted in Europe.

(10.) *Test by Insolubility in Alcohol.* One gramme of the dried and finely pulverized salt is digested with 18 cc. of alcohol (90 per cent.), in a stoppered test-tube, at ordinary temperatures, frequently shaking, for several hours. Sulphate, carbonate, iodate, nitrate, and even much bromide, if present, will remain undissolved. The operation serves only to show gross adulterations, and any residue found must be tested qualitatively. If absolute alcohol be taken, not less than 40 cc. must be used, and the action is slow and unsatisfactory.

The summary on the next page presents the results of the tests designated, according to details already given, as numbered. The observations were taken across a test-tube of the width of *two* centimeters—a little more than $\frac{3}{4}$ inch—in the tests (1), (2) with lime-water, (3), (4), and (5). In tests (1) "without starch," the same results were obtained with diluted sulphuric acid, and with a crystal of tartaric acid. In tests (4), the U. S. Ph. tests were supplemented by adding hydrochloric acid, because of the alkalinity found in some of the samples, and to make the test uniform for all.

Numbers 1, 2, and 3 were the American samples; numbers 4 and 5 were the European samples.

These samples of home manufacture furnish a very small but I believe a fair representation of the medicinal iodide of potassium of this country. Different lots of the salt, as put out by any one of our American manufacturers at different times, will certainly differ from each other materially, and perhaps differ as much as do the several samples in this examination. By taking a greater number of samples, truer averages can be obtained, and no comparison between the goods of different manufacturing houses should be based wholly on one or two samples from each, or on samples taken at one time. Of the foreign samples, I can only say that they are single instances of the pharmacopœial salt as put forth by foreign makers of high standing. It will be seen that one of the three American samples stands fully as

well as the average of the European samples, and a little better than one of them. I do not present the results of tests of these few samples alone, as giving conclusive answer to the latter clause of the query, or full answer to the first clause of it. But I have no information to oppose to the bearing of these few examinations, and have had a little experience, before mentioned, going to support the results here found. Therefore I believe it will be found that a buyer must exercise some selection in lots in order to obtain the medicinal salt of this country in as good a degree of purity as the average imported pharmacopœial article.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
(1) *For Iodate:* U. S. Ph. test, solution 1 to 20, with starch	No color.	Purple-blue	No color.	No color.	No color.
Solution 1 to 4, with starch	Purplish.	Pale blue.	Purplish.	Purplish.	Purplish.
Solution 1 to 20, acid, without starch	Slight yel'w	Pale yellow.	No color.	Pale straw color	No color.
Result	*Standard.*	*Hardly up to standard.*	*Standard.*	*Standard.*	*Standard.*
Comparison as to iodate (1 = best)	3	4	1	2	1
(2) *For Alkali:* U. S. Ph. test, wet litmus paper	Deep blue.	Deep blue.	Violet-blue.	Faint blue.	Violet-blue.
Solution of 1 to 2, with lime water	Precipitate.	Precipitate.	No precip.	No precip.	No precip.
Volumetric estimation of K_2CO_3	0·74 per cent.	1·84 per cent	0·05 per cent	0·24 per cent.	0·04 per cent.
Result	*Below stand.*	*Below stand.*	*Standard.*	*Hardly up to standard.*	*Standard.*
(3) *For Chloride and Bromide:* U. S. Ph. test	Precipitate at once.	Prec. at once	Sl't cloudi-n's at once	Sl't cloudi-n's at once	Cloudiness at once.
Test for bromine	Present.	Present.	Present.	Present.	Absent.
Result	*Not stand'rd*	*Not stand'rd*	*Not stand'rd*	*Not stand'rd*	*Not stand'rd*
Comparison	3	4	1	2	1
(4) *For Sulphate:* U. S. Ph. test (adding hydrochloric acid)	Cloudy in 5 min.	Prec. at once	Prec. at once	Cloudy in 5 min.	Clear.
Result	*Not quite standard.*	*Not stand'rd*	*Not stand'rd*	*Nearly standard.*	*Standard.*
Comparison	3	4	5	2	1
(5) *For Cyanide:* Ph. Germ. test	No cyanide.	No cyanide.	No cyanide.	No cyanide.	No cyanide.
(6) *For Sodium Salt:* Ph. Germ. test, flame color	Yellow	Yellow	Yellow.	Violet.	Yellow.
U. S. Ph. identification of potassium	Potassium.	Potassium.	Potassium.	Potassium.	Potassium.
(7) *For Moisture:* Loss at 212°F. (100°C.)	1·4 per cent.	1·3 per cent.	0·6 per cent.	0·8 per cent.	0·4 per cent.
(8) *For Free Iodine:* The solution with carbon disulphide	None.	None.	None.	None.	None.
(9) *For Nitrate:* In filtrate from silver precipitate	None.	None.	None.	None.	None.
(10) Sensible Properties: Color	White.	White.	White.	White.	White.
Odor	Dist'ct odor.	No odor.	Faint odor.	Faint odor.	No odor.

None of the pharmacopœial deficiencies found are very grave in character. In the most important medicinal requirement, the *absence of iodate* or of more than traces of it, one of the samples is just upon the U. S. Ph. test-limit, and the others are standard (though No. 1 does not stand very strong in this test). In the *limit of alkali*, a requirement of less medicinal than pharmaceutical importance, the pharmacopœias have been very lax. Two samples are below the exact standard and one just upon it. The *limit of chloride and bromide* is one more difficult for the manufacturer to control, and a margin beyond this limit is less injurious. Here none of the samples quite meet the U. S. Ph. standard. In the case of numbers 1 and 2, the presence of chloride, though probably not over 1 to 1¼ per cent. of the salt, had doubtless been the cause of the larger access of moisture found in test (7), and had thereby diminished the chemical stability of the salt. In numbers 3, 4, and 5, the slight proportions of chloride and bromide beyond the limit, may well be passed as not important. Most of the samples were found, also, with too much *sulphate*. This completes the list of the pharmacopœial deficiencies.

It is certainly desirable that our medicinal iodide of potassium should be so far improved as to be made uniform with its best portions, these being already nearly or quite conformable to the requirements of the Pharmacopœia. Especially in the important features of absence of iodate, and close limit of alkali, the standard (fortunately fixed by the simplest possible of tests) may well be looked after by purchasers. Indeed the manufacturers need the encouragement of an intelligent appreciation to enable them to eliminate deficiencies from their products. It is asking much of the honor and sagacity of men that they should devote care and capital to provide grades of purity never to be recognized by one in a hundred of the consumers. It is leaving a good deal to the manufacturers, that it should ever be their part to stimulate a demand for sounder qualities of their products.

Medicinal chemicals may be tested and valued with more readiness and certainty than most other articles of commerce. The wardens of their consumption are the dispensing pharmacists. A demand for strictly pharmacopœial chemicals, an intelligent, healthful, steady demand, if it comes at all, must come through the avenues of daily trade from dispensing pharmacists who habitually apply their own tests, value their own purchases, verify pharmacopœial standards, and know their own best business. Such a good demand will cause the

distinctions of pharmaceutical purity to be attentively regarded by every class of dealers. With such a demand the manufacturer is admonished that he may make expenditures needful for standard products.

CONTRIBUTIONS TO THE CHEMISTRY OF TARTARIC AND CITRIC ACID.

BY THE LATE BEAUMONT J. GROSJEAN,

Chemist to Sir J. B. Lawes' Citric and Tartaric Acid Factory, Millwall: compiled from the Author's Manuscripts by R. Warington.

A word of preface is perhaps necessary. Mr. Grosjean was associated with myself for five years, 1870–75, in the Laboratory, at Millwall, and he remained there as sole chemist from Midsummer, 1875, till his death on June 11th, 1882. During this time he conducted with great care many investigations, both on methods of analysis and on processes of manufacture. A paper "On the Determination of Tartaric Acid in Lees and Inferior Argol, with some Remarks on Filtration and Precipitation," was communicated by him to the Society in April, 1879. The greater portion of his results remained unpublished; they were, however, for the most part fairly written out in the form of Reports. From these Reports, from letters, and from the Laboratory Note-books, I have, with the consent of Sir J. B. Lawes, prepared the following abstract of a portion of his results:

Different Rate of Loss of Different Specimens of Citric Acid in Dry Air.

In my own earlier experiments ("Chem. Soc. J.," 1875, 928) the different behavior of different samples of powdered citric acid had already been noticed. In some cases the crystallized citric acid lost the whole of its water when placed over oil of vitriol for 4–6 days; in other cases nothing was lost in five days. Mr. Grosjean afterwards met with similar results. In one instance he was fortunate in commencing on the same day determinations of water in three specimens of citric acid, which, as the experiment progressed, proved to be of different characters. Specimen A was a fine crystal obtained from Mr. D. Howard. Specimen B was a part of fine crystals made at Millwall. Specimen C had been obtained by recrystallizing B in the laboratory. All the crystals were freed from any adhering moisture with blotting-paper, and then powdered. Of A, 3 grams, and of B

and C 1 gram were taken. Specimens B and C were placed in the same desiccator; A in another, standing by the side. Both desiccators contained fresh oil of vitriol, sp. gr. 1·845. In the following table will be found a selection from numerous successive weighings of the three specimens. The experiment commenced on April 21st, 1880:

TABLE I.—*Gradual Loss of Water by three Specimens of Citric Acid Crystals in Dry Air.*

Date of weighing.	Days since commencement.	Total loss per 100 of original weight.		
		A.	B.	C.
April 23	2	0·00	0·00	0·70
" 27	6	0·10	0·35	5·55
" 30	9	0·23	1·40	7·60
May 4	13	0·52	4·25	8·50
" 6	15	0·68	6·25	8·55
" 11	20	1·12	8·05	
" 15	24	1·75	8·55	
" 22	31	2·85		
" 28	37	4·38		
June 4	44	5·35		
" 12	52	7·92		
" 21	61	8·47		

The theoretical amount of water in citric acid crystals is 8·57 per cent.

The very different degrees of tenacity with which water is held in different citric acid crystals is probably connected with some difference in the structure of the crystals, determined by the conditions prevailing during crystallization. It is clear from the above results that when the molecular structure has been weakened by the loss of some water, the crystal parts with a considerable portion of the remainder with comparative ease; the last portions of water are, however, lost with great slowness.

Determinations of Citric Acid in Lemon and other Juices.

The value of lemon juice has usually been determined from its acidity. Besides the free acid a certain amount of combined organic

acid is also present ("Chem. Soc. J.," 1875, 931). The whole of the free and combined acid in lemon juice is not, however, citric acid. The method employed in the Millwall Laboratory for determining the amount of citric acid present, or rather the amount of organic acid capable of yielding an insoluble calcium salt, has been already described (*Ibid.*, 934). The juice is exactly neutralized with soda, an excess of calcium chloride added, and the calcium citrate precipitated by boiling in a salt or glycerin bath. The precipitate is collected and washed with hot water. The filtrate and washings are neutralized with dilute ammonia, and concentrated in the bath to a small bulk; the second precipitate thus obtained is also collected and washed. Mr. Grosjean was in the habit of concentrating yet a second time, and collecting a third precipitate, if any. The precipitates are finally ignited, and the citric acid originally present calculated from the neutralizing power of the resulting carbonate of calcium. Working in this way, with 1 gram of citric acid, Mr. Grosjean obtained 99·6 per cent. of the acid taken.

In Table II (p. 509) will be found determinations of free acid, and of precipitable acid, made by Mr. Grosjean in commercial samples of concentrated lemon and other juices; the acid found is in all cases calculated as citric acid:

It appears from the figures given in the table that the precipitable acid in commercial concentrated Lemon juice is, on an average, very nearly equal in quantity to the free acid present; in 65 analyses, representing 895 pipes, the precipitable acid averages 99·2 per cent. of the free. There is, however, occasionally a somewhat considerable range of variation, as will be seen from the figures showing the highest and lowest proportion of precipitable acid found in the 65 samples. In two exceptional samples of juice, A and B, representing together 27 pipes, the proportion of precipitable acid is much lower; and in one sample, representing 25 pipes, not mentioned in the table, as it seemed to lie intermediate between lemon juice and bergamot, the precipitable acid was only 81·1 per cent. of the free. There can be no doubt, therefore, that the method of precipitation ought to be adopted in all valuations of commercial lemon juice.

The analyses of concentrated Bergamot juice are much fewer; the proportion of precipitable to free acid appears very similar to that in lemon juice.

TABLE II.—*Determinations of Free and Precipitable Acid in Concentrated Lemon and other Juices.*

	Specific gravity of juice.	Acid, reckoned as citric (ozs. per gallon).		Precipitable for 100 of free acid.
		Free acid.	Precipitable acid.	
Lemon juice—				
Highest	1·235	61·2	63·4	103·6
Lowest	1·240	64·8	61·9	95·5
Mean of 895 pipes	1·241	62·1	61·6	99·2
Sample A	1·240	65·8	59·7	90·7
" B	1·235	64·9	55·7	85·8
Bergamot juice—				
Highest	1·235	47·9	48·5	101·4
Lowest	1·235	52·3	49·9	95·4
Mean of 90 pipes	1·237	50·1	49·3	98·4
Lime juice—				
Sample A	1·326	108·3	99·8	92·2
" B	1·205	59·2	53·9	91·1
Orange juice—				
Sample A	1·400	16·8	11·6	69·0
Sample B	1·350	11·7	8·0	68·4

There are only two analyses of concentrated Lime juice; both show a distinctly low proportion of precipitable acid, a result confirmatory of the analyses already published ("Chem. Soc. J.," 1875, 936).

The two specimens of concentrated Orange juice show, as we should expect, a very small amount of free acid. This acid is also to a considerable extent not citric, the acid precipitable as calcium salt bearing a smaller proportion to the free acid than in any of the other juices analyzed.

The figures in the table clearly show that specific gravity is no guide to the value of juice. All lemon juice is brought as nearly as possible to the standard gravity of 1·24 for the purposes of sale.

Influence of Heat on Solutions of Tartaric Acid.

That crystallized tartaric acid when fused at 170° is converted into

metatartaric, and at a higher temperature, or by longer heating, into ditartaric acid, is well known. According to Gmelin, the change into metatartaric acid may be effected in the presence of a small quantity of water; 2 or 3 parts to 60 of acid. Some of my own experiments with the tartaric liquors of the factory ("Chem. Soc. J.," 1875, 988) had made it probable that the same change may to some extent occur when solutions of tartaric acid are concentrated in the ordinary way over steam, as it was found that two such liquors, when diluted and boiled for three hours, yielded 3·36 and 3·68 per cent. more of tartaric acid than before boiling. Mr. Grosjean has now amply proved that solutions of tartaric acid, concentrated on a water-bath, may undergo conversion into metatartaric acid to a very considerable extent. He has also shown that in a dilute solution, the reverse change, even in the cold, will slowly take place.

I. 40 grams of tartaric acid were dissolved in water, concentrated in a beaker over a water-bath till a crust formed on the surface, and maintained four hours in this condition; the temperature of the tartaric solution was 93°. When cold, the whole was redissolved and brought to a litre. The acidity was now 97·9 per cent. of the original; while the tartaric acid, found by precipitation with citrate of potassium, was only 74·6 per cent. of the tartaric acid taken. On boiling a portion of the diluted solution for two hours, the acidity was raised to 99·9 per cent., and the tartaric acid also to 99·9 per cent. of the original acid, showing that a complete reversal of the reaction had been effected.

The remainder of the diluted solution which had not been boiled was mixed with a little phenol, and the amount of tartaric acid determined from time to time with the following results:

August	24,	1861,	tartaric acid,	74·6	per cent.	of original acid.
"	25,	"	"	77·2	"	"
"	31,	"	"	81·7	"	"
September	16,	"	"	88·0	"	"
October	18,	"	"	90·0	"	"

The experiment now ceased for want of material.

II. 80 grams of tartaric acid were treated as before, the heating being continued 3½ hours after a crust had formed; the temperature of the solution was 92°. When cold, the beaker was weighed. Assuming that it still contained 80 grams of tartaric acid, the water present was 24·75 grams. Redissolved and diluted to one liter, the

acidity was found to be 97·7 per cent. of the original tartaric acid. Phenol was added, and the proportion of tartaric acid determined from time to time in the unboiled solution, with the following results:

September	23,	1881,	tartaric acid	84·3	per cent. of original acid.
October	18,	"	"	88·0	" "
November	25,	"	"	92·2	" "
January	6,	1882,	"	96·2	" "
February	9,	"	"	96·7	" "

It will be noticed that the reconversion in the cold took place at first with some rapidity, but afterwards at a diminishing rate. In neither experiment is it absolutely completed, although in the last experiment the observations extended over 137 days.

With tartaric liquors containing a considerable amount of sulphuric acid, Mr. Grosjean found a smaller production of metatartaric acid on heating. The following experiment, save for the presence of sulphuric acid, is a duplicate of Experiment II.

III. 80 grams of tartaric acid were dissolved in water, with 16 grams of oil of vitriol; the solution was heated in a beaker on the water-bath till a crust formed; heating was then maintained for 3½ hours; temperature, 92–94°. When redissolved the acidity had diminished to 97·6 per cent., and the tartaric acid to 90·2 per cent. of the tartaric acid taken.

Mr. Grosjean has further confirmed my earlier results respecting the presence of metatartaric acid in factory liquors. In one liquor he obtained an increase of 6·4 per cent. of tartaric acid by dilution and boiling; while in another old liquor the increase following this treatment was 7·6 per cent. In a third instance the metatartaric acid did not amount to more than 1 per cent. of the total tartaric acid. Ditartaric acid was not found in any case.

Influence of Sulphuric Acid on the Crystallization of Tartaric Acid.

The presence of much free sulphuric acid considerably diminishes the solubility of tartaric acid at ordinary temperatures. When to a saturated aqueous solution of tartaric acid half its volume of oil of vitriol is added, and the mixture cooled and stirred, an abundant separation of tartaric acid takes place. There is also apparently a greater difference between the solubility at high and low temperatures when sulphuric acid is present. A hot saturated solution of tartaric acid in water will deposit about 50 per cent. of its tartaric acid on

standing in the cold a few days. A hot solution of tartaric acid in 1 volume of water, and 1½ volume of brown oil of vitriol (sp. gr. 1·713), deposited 70 per cent. of its tartaric acid on standing. The mother-liquor, amounting to 260 cc., contained only 30 grams of tartaric acid. The free sulphuric acid, always present in crude tartaric liquors, though in other ways injurious, thus allows a greater proportion of the acid to be obtained by a single crystallization. The above observations were made in 1881.—*Jour. Chem. Soc.*, July, 1883.

COMMERCIAL NITRITE OF SODA.

By Peter MacEwan.

The purity of nitrite of soda as found in trade at the present time has been discussed in the *Pharm. Journal*, [3], xiii., pp. 995, 1032 and 1052.

The method of preparing this salt most familiar to pharmacists is that of the British Pharmacopœia, 1864, namely, by fusion of a mixture of nitrate of soda and charcoal. The investigations of Howard, Miller and Warrington[1] showed that the product so obtained is a mixture of carbonate, hydrate, nitrate and nitrite of soda, the latter in varying quantity, never exceeding 42 and generally less than 25 per cent. To obtain a better article Mr. Howard suggested that the mixture should be dissolved and fractionally crystallized, the nitrite crystallizing after the carbonate and nitrate. This undoubtedly yields a purer nitrite, but it does not get rid of the principal objections to the charcoal process, namely, somewhat uncontrollable deflagration and formation of a large percentage of carbonate. By the employment of other deoxidizing agents, such as lead or copper (in a fine state of division), these objections are overcome, and a product obtained having a higher percentage of nitrite associated with nitrate and a small proportion of hydrate. This, by fractional crystallization, will yield a salt corresponding to Mr. Ekin's description, that is, containing "98 per cent. of real nitrite, the 2 per cent. of impurity consisting chiefly of moisture."

Previous to the communications of Dr. Hay and Mr. Ekin I had had opportunity of examining several commercial specimens of the salt, and since then have obtained a number from different parts of the country. The following table shows the results of the examination

[1] *Pharm. Journal*, [2], vii., pp. 7, 95 and 204.

of twelve of these, which I take to represent fairly the commercial article:—

No.	Characters.	$NaNO_2$. Per cent.	Na_2CO_3. Per cent.
1	Large transparent crystals, very moist	0·011	35·5
2	"Old stock," small crystals, brownish	0·028	29·66
3	Large transparent crystals, very moist	0·945	32·6
4	Fused mass, white	9·6	27·34
5	White and granular, very moist	28·4	
6	White and granular, dry	84·14	
7	Small crystals, white, moist	92·5	
8	Small crystals, brownish, moist	93·65	
9	Small crystals, white, moist	95·1	
10	Small crystals, brownish, moist	95·83	
11	Small crystals, white, dry	97·21	
12	Small crystals, white, dry	98·5	

Nos 1 to 3 are evidently the first crop of crystals from a solution of such a specimen as No. 4, which, itself, answers the description of the 1864 Pharmacopœia preparation. Nos. 5 and 6 contained undecomposed nitrate and the former much water. The others contained water in varying proportions and but mere traces of other impurity, the higher percentages of Nos. 11 and 12 being accounted for by the fact that they were examined as received from the makers, while the others had been in stock for a few months.

The percentages in this case were determined by decinormal permanganate of potash solution, which gives good results with care and some practice. A very good plan is to fill a burette with a solution of the salt under examination (1 gram in 100 cc. distilled water is a convenient strength) and drop carefully into a flask containing 10 cc. permanganate and an equal volume of sulphuric acid (1 in 4) until a pale pink color is struck, which should not disappear within thirty seconds. The quantity of nitrite solution being noted, the titration is repeated twice, it being merely necessary to add 10 cc. of permanganate to the contents of the flask each time. The mean of the three estimations is taken for calculation, 10 cc. of the permanganate solution being equivalent to ·0345 gram $NaNO_2$. Old stock of this article should be looked over. The fused "nitrite of soda" of the 1864 Pharmacopœia

(which I understand is not unfrequently sent out by wholesale houses) should certainly not be dispensed, and as the crystalline and granular varieties may be either good or bad, their strength should be ascertained and stock replaced if necessary.—*Pharm. Jour. Trans.*, Aug., 1883, p. 121.

INFLUENCE OF CALOMEL ON FERMENTATION AND THE LIFE OF MICRO-ORGANISMS.

By N. P. Wassilieff.

Calomel has always held a foremost place amongst those remedies which are confidently resorted to in certain gastric and intestinal disorders, especially of childhood, but the precise nature of its beneficial effect has heretofore been unexplained. Recent works on pharmacology pass over the question, and only Köhler refers to the favorable action of the drug in typhus, cholera, dysentery, and other diseases, as being due to its germicidal and anti-fermentative qualities. No evidence in support of this view is adduced. Voit, however, had noticed in 1857 that egg-albumin and blood, when mixed with calomel, remained for days without undergoing putrefaction. Hoppe-Seyler also mentions an aseptic influence of calomel, and ascribes to it the well-known green color of bowel discharges after an administration of calomel.

The author undertook this investigation at the request of Hoppe-Seyler, first, in regard to the behavior of calomel towards the so-called unorganized ferments of the digestive fluids (enzymes,) and secondly, as to its action on the lower organisms associated with the processes of fermentation and putrefaction.

The first series of experiments were made in order to determine the influence of calomel on the normal process of digestion in the stomach. The results proved that its presence in no way interfered with the properties of the gastric juice, fibrin being digested in the same time, whether calomel was present or not.

In the next series, the influence of calomel on the process of pancreatic digestion was investigated. It is now known that three separate ferments exist in the pancreatic secretion by which albuminates, fats, and carbohydrates are severally transformed and fitted for assimilation in the system. The object in view was to observe the possible influence of calomel on each of these respective ferments. For the purpose of experiment a watery extract was prepared from the finely minced gland,

and strained through linen. It was found that the action of the ferment, by which albuminates become digested, was in no respect hindered by the presence of the calomel, and further, that there was a conspicuous absence from the liquid mixture of all products of putrefaction. In the mixture containing calomel, large quantities of leucin and tyrosin were found, whilst indol and phenol were absent. In the mixture without the addition of calomel, the two latter bodies were both present, but only traces of leucin and tyrosin. The latter solutions had likewise a putrid smell and a dirty brown color, whilst the former was of dark grey color and odorless.

In some additional experiments, wherein the process was allowed to proceed in a Bunsen gasometer, and the evolved gases examined, it was found that from the mixture containing calomel, hydrogen and hydrogen sulphide were never given off, and carbonic anhydride in very considerably less amount than from the control mixtures without calomel.

These results accord with those of Hüfner (*J. pr. Chem.*, Vol. 10 and 11,) who found in his experiments on artificial digestion with pancreatic extract, that when by means of a properly arranged apparatus entrance of micro-organisms was prevented, neither hydrogen nor hydrogen sulphide made its appearance, but only carbonic anhydride. These two first-named gases have therefore nothing to do with digestion proper, but are the result of putrefactive changes, brought about by the presence of microzymes in the alimentary canal. The action of calomel on the ferment of the pancreatic juice, to which the digestion of fat is due, was next examined. The existence of such a principle has, until now, been considered highly doubtful, Paschutin's observations on this head being all that is known of the subject (W. Paschutin, *Ueber Trennung der Verdauungsfermente. Centralbl. für die Medicin. Wissensch.*, 1882.)

As in putrid solutions, fats become saponified rather quickly, the problem became an important one to determine whether the transformation of fat in the alimentary canal was owing to the action of an unorganised ferment or merely to the putrescent changes going on there. The experiments made proved beyond a doubt that the action of pancreatic juice upon fat took place in the complete absence of putrefaction, and the digestion of the fat by the pancreatic extract in presence of calomel, proceeded precisely as in the instance of the experiments in regard to the peptic ferment (trypsin) of that gland.

The action of the third and remaining ferment of the pancreas, the

diastatic, upon starch, and the transformation of the latter into glucose, proceeded equally undisturbed in the presence of calomel. Hence it follows that calomel, by its presence in these experiments on artificial digestion, allows the actual process of digestion to go on without injury, whilst it effectually prevents putrefactive change. And this in the same way as proved for salicylic acid by Kühn, and in the case of arsenic by Scheffer and Böhm.

The author also found the action of calomel in the process of butyric acid fermentation, which sometimes occurs in certain pathological states of the digestive system, similar to that in common putrefaction, entirely preventing it.

A further series of experiments, which need only be referred to here, were carried out to determine the disinfectant action of calomel in fluids containing bacteria and micrococci, the bacterioscopic method of Bucholtz-Wernich being used. The results showed that calomel acted as a true antiseptic and disinfectant in preventing the development of such organisms in culture fluids, and arresting their activity when already developed therein.

The difference in the influence of calomel on the process of digestion on the one hand, and on putrefactive and fermentative changes on the other, is dependent upon a distinct difference of action on organized and unorganized ferments. Whilst it does not interfere with the activity of the latter, it destroys the vitality of the former, and with it the power of inducing subsequent septic changes.

Finally, as regards the green color of the bowel discharges witnessed after the exhibition of calomel, this was formerly attributed to the presence of bile, expelled by virtue of the assumed action of calomel as a cholagogue; this appearance was considered by Hoppe-Seyler to be due to the presence of undecomposed bile, and the author's experiments now confirm this view. Under ordinary conditions, the bile pigments, bilirubin and biliverdin, become decomposed in the intestine under the influence of putrescent changes, forming hydrobilirubin. During the administration of calomel this decomposition does not take place, and the bile pigments are expelled unchanged.

The author concludes that the therapeutic virtues of calomel are to be ascribed to its antiseptic and disinfectant properties.—*Jour. Chem. Soc.*, July 1883, p. 743.—*Zeitschr. physiol. Chem.*, vi. 112–114.

ON THE ACTION OF LIGHT AND HEAT ON CANE AND INVERT SUGARS.

By J. H. Gladstone, Ph.D., F.R.S., and Alfred Tribe, F.C.S.,
Lecturer on Chemistry in Dulwich College.

Nothing is more familiar to chemists than that living yeast-cells, and some other vegetable structures, are capable of resolving cane-sugar into alcohol and carbonic anhydride; and this decomposition is the more interesting as all attempts to bring it about by known chemical or physical processes have hitherto failed. We thought it worth while to try the effect of the copper-zinc couple at the ordinary temperature. The reaction did not take place in a 5 per cent. solution of cane-sugar: hydrogen was of course evolved (from the water), but no carbonic anhydride. At 100° C., however, carbonic anhydride was slowly evolved, and a small quantity of liquid distilled over, which gave iodoform on treatment with iodine and potassium hydrate, and acetic acid on treatment with potassium chromate and sulphuric acid. Our hopes appeared to be realized, but on examining the chemical change more fully, we found that the carbonic anhydride did not come from the sugar at all, and that the organic substance which distilled over was not alcohol, and was not dependent upon the couple for its formation. In fact, the carbonic anhydride arose from the splitting up of oxicarbonate of zinc, which is formed in the washing of the couple, and of which we had no previous knowledge; while the organic body is a product of the action of heat upon the sugar solution.

While investigating this subject, we made various observations regarding the influence of heat, light, germs, and air upon solutions of cane and altered sugar (glucose), and as they may help to clear up some of the contradictory statements that have been made upon this subject, we are induced to record the most important of them.

1. *The Action of Heat on an Aqueous Solution of Cane-Sugar.*

The usual mode of experimenting was to take a number of tubes with narrow tubules of about 20 cc. capacity, and nearly fill them with a solution of pure cane-sugar (5 grams to 100 cc. of distilled water), which was then boiled for about five minutes in an oil-bath. To determine the effect of heat in absence of air, some of the tubes were sealed while the liquid was still boiling. About 15 cc. of the solution in a sealed tube were exposed for 14 days to a temperature of 90° to 95° C.; it slowly became of a pale yellow color, and was found to contain 3·6 per cent. of glucose, was acid to test-paper, and, on dis-

tillation, the iodoform-producing substance was detected. In another experiment the heating was prolonged to six weeks; the solution became much darker in color, and contained some yellowish-brown matter, which readily dissolved in a solution of potassium hydrate, from which it was again precipitated on the addition of an acid. The solution was slightly acid, contained 2·8 per cent. of glucose, and yielded the iodoform-producing compound. It would appear, then, that nothing but an elevated temperature is necessary to convert an aqueous solution of cane-sugar into glucose and an acid body, with a minute quantity of an unknown volatile substance.

Experiments were made to ascertain whether the iodoform-yielding body is produced immediately from glucose, and whether carbonic anhydride accompanies its formation. 400 cc. of a 5 per cent. solution, prepared carefully by ourselves, were boiled in a retort, and the distillate tested from time to time, and the substance we were in search of was detected in successive portions of the distillate; boiling water was added to the residue to make up the volume, and the air was driven out of the apparatus by a stream of pure hydrogen. The slow boiling was continued for 12½ hours, hydrogen passing through the apparatus, and subsequently through tubes containing baryta-water; the distillate contained, as before, a small quantity of the volatile compound, but no carbonic anhydride. It is evident, therefore, that the chemical reaction is essentially different from a vinous fermentation, and that the iodoform-yielding compound is not alcohol is also proved by its totally distinct odor, and the different volatility of its aqueous solution; it is not separated from water by potassium carbonate, and no other means have been found for its isolation.*

In our original experiments, in which the copper-zinc couple was heated to about 100° C. with cane-sugar solutions, only traces of glucose were ever produced, even after the action had continued for weeks. This agent therefore prevents the conversion, probably by neutralising or destroying the acid compound as quickly as it is produced. It is remarkable also that a solution of cane-sugar remains colorless apparently any length of time, when heated with the copper-zinc couple.

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*Mr. Horace T. Brown has drawn our attention to a paper "On the Electrolysis of Sugar Solutions" in Jour. Chem. Soc. of July, 1872. He mentions an iodoform-producing body, which was probably the one here described, as he subjected his solution of glucose to distillation.

2. *Influence of Light, Atmospheric Germs, and Air.*

It seemed of interest to examine some of the conflicting statements in regard to the conversion of cane-sugar into glucose. A number of the tubes previously described were very nearly filled with a 5 per cent. solution. Twelve were sealed, while the solution was boiling, and six of them were exposed to full daylight at ordinary temperatures, the other six being kept in the dark. Six more were opened to the air, the tubules being plugged with cotton-wool, and three of them were exposed to daylight, and sometimes to the direct rays of the sun, the other three being kept in complete darkness. Six others were prepared with the tubules open, three being exposed to the light, and three kept in the dark. After allowing the whole of these tubes to remain from December, 1877, to May, 1879, the solutions were examined for glucose and fungoid growths. The amounts of glucose found in the several experiments, are shown in the subjoined table:—

Nature of Experiment.	Grams of Glucose in 100 c. c.						
	I.	II.	III.	IV.	V.	VI.	Mean.
Solution boiled in tubes, but not exposed to light, etc.	0·0162	0·0185	0·0162	0·0168	0·0200	.....	0·0177
In sealed tubes.							
(i). Exposed to light	0·0187	0·0116	0·0193	0·0160	0·0145	.....	0·0160
(ii). In darkness	0·0145	0·0250	0·0152	0·0232	0·0203	0·026	0·0207
In tubes plugged with cotton-wool.							
(i). Exposed to light	0·0203	0·0193	0·0261	.....	.....	.....	0·0219
(ii). In darkness	0·0246	0·0272	0·0262	.....	.....	.....	0·0260
In open tubes.							
(i). Exposed to light	0·0366	0·0225	0·0490	.....	.....	.....	0·0360
(ii). In darkness	0·0214	0·0325	0·0354	.....	.....	.....	0·0297

As the very method of preparing these solutions produces about as much glucose as was found in the tubes 17 months afterwards, the above results show that neither light nor air, singly or jointly, changes cane-sugar in aqueous solution at the ordinary temperature.

As Rouet (*Compt. rend.* for 1871, p. 1040) states that a solution of 10 grams of white cane-sugar in 50 grams of water, enclosed in sealed tubes from which the air has been expelled by boiling the liquid, and exposed for five months to light, was found to be half-converted into

glucose, we made four experiments with solutions of this strength; and obtained substantially the same results as before.

All the solutions in the sealed tubes were found to be perfectly bright, and free from fungoid growths, as were those in the tubes plugged with cotton-wool and exposed to daylight. On the other hand, all the solutions open to the air contained white matter at the bottom of the tube and fungoid filaments in the liquid. In the tubes that were plugged with cotton-wool, but kept in the dark, a smaller quantity of white matter—about a millimetre in diameter—was found at the bottom of the liquid in each case. A microscopical examination of the white matter was kindly made by Dr. Lionel Beale, who reported that "the fluid contained abundant evidence of living organisms—micrococci, bacteroid bodies, and mycelial filaments."

It would appear then that light is detrimental to development of fungoid growths in a solution of cane-sugar exposed to atmospheric air.—*Jour. Chem. Soc.*, Aug., 1883, p. 341.

NOTES ON CINCHONA BARK.

By David Howard.

A curious evidence of the singular scientific acumen shown by the late Mr. McIvor in working out his process for renewing cinchona bark is given by some of the samples of "renewed" *C. succirubra* bark which reach us from Ceylon.

As is well known, in Mr. McIvor's process, alternate strips of the bark were removed down to the cambium, and the tree wrapped round with moss. The bark then renews over the whole surface, the new bark consisting almost entirely of cellular tissue, the total alkaloid being increased, and the cinchonidine giving place to quinine.

The "renewed" bark to which I call attention, on the other hand, shows a totally different structure; there is a mere skin of cellular tissue, the remainder being remarkably fibrous.

The explanation is not far to seek, the shaving process recommended by M. Moens as a substitute for Mr. McIvor's process gives good results just in proportion as it imitates the latter process. If the cut is sufficiently deep to cause the effusion of new bark, if I may so call it, the result both in quantity and quality of the renewed bark closely resembles that yielded by the stripping process.

But if, as is often now the case, the shaving is merely superficial and carried all around the tree the result is entirely different; in this case there is little or no formation of cellular tissues to replace that removed, a fresh epidermis forms, but apparently the circulation is carried on in the remaining fibrous tissue, which in fact seems to be developed further. The alteration in the composition of the alkaloid which is so characteristic of the true renewal does not take place in this case; if there is any change it is rather in the direction of an increase of the cinchonidine instead of quinine.

The subject is not merely interesting from the light it throws upon McIvor's process, but it is one of great commercial importance. Unless the shaving process is so carried on as to produce, at least in part, the beneficial results of the older process of renewal it will lead to grievous disappointment, for the trees seem to suffer more from the wrong treatment than from the right.

It is to be feared that in many cases the temptation to get a quick return from the plantation by over-frequent and unskilful shaving is risking not only the quality of the crop but the health of the trees. Some planters are even advocating a return to the barbarous system of coppicing; but it is difficult to believe that this will generally be the case, with the strong evidence before their eyes of the benefits to be obtained by the more scientific system of treatment.

I do not venture into the vexed questions of hybrids and species in red bark; but when I find that "red bark" can be obtained yielding up to 4 and 5 per cent. of quinine from natural bark, I am very sure that there is a great field for skill in the selection or cultivation of cinchonas. There is much to be learned in these matters. In the last drug sales, some samples of bark marked "hybrid" gave 4 per cent. of quinine, while others, also "hybrid," gave only 1 per cent. of quinine.

It is evidently no easy matter to distinguish by the eye the different varieties of trees which produce red bark of widely different quality. Some time ago I analyzed a number of samples of bark from individual trees, sent me by J. A. Campbell, Esq., from Ceylon. They were renewed bark from trees giving red bark of very fine quality; the plants were all from the same nurseries, and were supposed to be of identical quality.

I found, however, that they varied very widely in the richness of the bark, as will be seen from the following table:

No.	Quinine.	Cinchonidine.	Cinchonine.	Quinidine.
1	6·2	0·3	0·3	0·1
2	2·6	0·6	trace.	0·4
3	2·0	1·6	1·2	0·2
4	4·0	0·2	0·2	0·1
5	4·0	0·2	0·7	0·7
6	2·3	0·5	1·2	0·8
7	2·3	0·9	1·7	0·0
8	2·8	0·3	1·3	0·1
9	4·1	0·1	0·2	0·1
10	3·9	0·1	0·2	0·2

Mr. Campbell tells me that "notwithstanding the extraordinary difference in the analysis there is little difference to be seen between the most of the trees. Some are pubescent, however, and some are glabrous; some have rounder leaves than others and in some the flower is white, except in the centre of the corolla tube which is pink. Others, again, have pink flowers. Nos. 1, 2, 4, 9 and 10 are what we used to call hybrids; of these 4, 9 and 10 are much like officinalis in leaf and bark. No. 2 is subpubescent in leaf and only a moderate grower, the leaf being rounder than 4, 9 and 10, and lighter in color. No. 1 is exactly what we would imagine, from Mr. Cross and Colonel Beddome's description, to be a true Pâta de Gallinazo. Leaf glabrous shiny on upper surface, soft, flat, and pointed at end; a fine grower considering the soil it is in." It is evident, therefore, that no general description will suffice to guide a planter in selecting the best sorts, but that the subject requires a minute study of individual trees of which the bark has been analyzed.

Calisaya bark shows equal variations between different trees. I have found individual trees growing together in Ceylon to vary from 3·1 per cent. to 9·2 per cent. of quinine, and individual trees similarly growing together in the Wynaad to vary from 7·6 per cent. to 0·7 per cent. of quinine.

These variations can hardly be attributed to soil; the red barks were all growing in similar soil and under similar circumstances, and the Ceylon calisayas were also apparently growing under similar conditions.

No doubt soil does influence the richness of the bark to a very great extent; samples of bark from trees grown on poor soils, as far as my experience goes, always test below similar barks on rich soils. The richest bark, both succirubra and calisaya, that I have tested from Ceylon has been from land richly manured for coffee.

I think I have given instances enough to show how great are the possibilities of advantage in selection of the richest varieties of bark, while the study of soils, and the best mode of manuring and of preserving the bark, offer a wide field for profit to the intelligent planter. It is evident that if an 8 per cent. bark can be obtained from a tree giving an equal crop to those yielding 1 per cent. bark the increased value of the crop must be out of all proportion to the extra care in selection. Whether planters will have to adopt grafting or propagation by layers or cuttings, or whether it will prove practicable to obtain certain results from selection of seed or plants, is a matter of experience. Everything points to a great over-production of inferior bark, but there is little fear of the better qualities bringing remunerative prices if wisely cultivated.—*Phar. Jour. and Trans.*

PSEUDO-GUTTA PERCHAS,[1]

OR SUBSTANCES SUPPLEMENTARY TO GUTTA PERCHA.

Foremost amongst pseudo-guttas, as we use the phrase, stands Balata gum. It is obtained from the *Mimusops Balata* of Gærtner (Nat. Ord. *Sapotaceæ*) and is synonymous with the *Sapota Mulleri* of Bleekrod, the *Achras Balata* of Aublet, etc. It is found in Demerara, Berbice, British and French Guiana, Antilles, Jamaica and Surinam. It has many vernacular names, amongst which may be mentioned, Balata, Paardenvleesch (Dutch—horse-flesh,) bullet-tree, etc.

One of the first writers on this substance was Professor Bleekrod, who communicated some information as to the plant and its product to the Society of Arts, in 1857. He, too, described the plant and named it *Sapota Mulleri.* In 1860. Mr. Walker communicated samples, etc., received from Dr. Van Holst, of Berbice, to the same Society, and in 1864 Sir William Holmes also drew attention to the same subject. The tree is a large one with a trunk of about 6 feet in diameter, and furnishes a wood much liked for building purposes and of the color of horse-flesh—hence the Dutch name. The bark is thick and rough, and the fruit is of the size of a coffee berry, sweet like a plum, and with a hard white kernel which yields a bitter oil.

The leaves are glossy, oval and accuminated. The milk is drunk by the natives, in cases of diarrhœa, and when diluted with water it is used as cow's milk. The trees grow in groups and in alluvial soil.

[1] From the *Indian Agriculturist.* Reprinted from the *Tropical Agriculturist.*

The "Balata" gum is of a character somewhat between caoutchouc and gutta percha, combining in some degree the elasticity of the one with the ductility of the other, freely softening and becoming plastic and easily moulded like gutta percha. What small parcels arrived in England met with a ready sale and were remarkably free from adulteration. But unfortunately, through the difficulty of collection—the undertaking being so dangerous and unhealthy—the supply of this excellent article has fallen off. It is collected by making incisions in the bark about 7 feet from the ground, and a ring of clay placed round the tree to catch the milk as it exudes. The yield is said to be in profusion especially at the time of the full moon, and the operation can be repeated every two months in the rainy season. It takes six hours to bring about coalescence by simple atmospheric influence, but very quickly by boiling in water. A large tree is said to yield as much as 45 lb. of "dry gum." The tree in every way is well worthy of a trial by acclimating it.

In India there are several plants whose products may be classed as pseudo-guttas. First and foremost of these we have the Pauchontee or India gutta tree, the *Bassia elliptica* of Dalzell the *Isonandra acuminata* of Lindley, but now known as *Dichopsis elliptica*. It is found in the Wynaad, Coorg, Anamallay and Neilgherry Hills, Sholah Forest, Cochin, Sichar, and according to General Cullen, "appears to be common in all the forest tracts at all within the influences of the southwest rains." This tree, which is now placed in the same genus as the true gutta percha, is a large one—from 80 to 100 feet high—and was first met with by Mr. Dalzell, in North Canara, near the falls of Goirsuppah, in 1849. Since that date General Cullen and Dr. Cleghorn have used every exertion to bring the substance prominently forward but without success. The gum is obtained by tapping, 1½ lb. being obtained from one tree by five or six incisions, a large tree yielding as much as 20 to 40 lb. of sap. Many experiments have been made with specimens of the raw milk, *i.e.*, milk simply dried by exposure to the atmosphere. The results of these experiments have shown that for telegraphic purposes it is wanting in some essential qualities, but it has been recommended as a subaqueous cement or glue. When dissolved in ordinary gutta percha solvents, it, after the evaporation of the solvent, remains some times soft and viscid, and partakes somewhat of the character of bird-lime. When cold, it is hard and brittle. Without wishing in the slightest degree to throw doubt or discredit on

the many and valuable experiments made, we would suggest that good samples be collected and treated in the same manner as recommended for gutta percha. We have no doubt that many a parcel of what would otherwise be *good* gutta percha, is spoilt through not being well boiled *immediately* after collection from the tree. At present this is the only way in which we see there is a possibility of ascertaining whether this product can be utilized, and we have the more hope from the fact that the structural character has led the plant to be placed in the same genus as the true gutta percha—structural affinity agreeing so often to chemical affinity.

There are in India other nearly allied *Sapotaceæ* which deserve attention in order to ascertain whether any of them yield a milky juice likely to be of commercial use. Amongst the *Euphorbiaceæ* there are two plants worthy of notice. The *Euphorbia Cattimandoo*, found in various parts of India, was first brought to notice by the Honorable W. Elliot, and a prize medal was awarded for this substance by the jurors of the 1851 exhibition. This spiny euphorb grows to the size of a shrub or small tree, and the milk flows out freely when a branch is cut. The natives use it as a cement to fasten knives in handles, etc. Under the influence of heat it becomes soft and viscid, and when dry, very brittle. The *Euphorbia Tirucalli*, the milk hedge or Indian tree spurge, is a succulent unarmed plant attaining a height of 20 feet, and its inspissated milk is used for various—chiefly medicinal—purposes, and has been recommended as a gutta percha substitute, but like gum *Euphorbium*, it has a very acrid character, and the collection is a very dangerous operation to the eyes.—*Phar. Jour.*, August 1883, p. 104.

ANALYSIS OF VEGETABLE TISSUES.

Firémy classifies the constituents of vegetable tissues as follows, the characters being derived from their chemical constitution ("Ann. Sci. Nat.," xiii, 1882):

1. *Cellulose Substances.*—In this group are included all those constituents of vegetable tissues which dissolve without coloring in bi-hydrated sulphuric acid, producing dextrin and sugar, which are not sensibly altered by alkaline solvents, and which resist for a long time the action of energetic oxidizers. Schweitzer's reagent (ammoniacal copper oxide) enables at least the three following varieties to be distinguished:

(*a*) *Cellulose.*—Dissolves immediately in the copper reagent. This constitutes the larger part of cotton hairs and of the utricular tissues of certain fruits.

(*b*) *Paracellulose.*—Dissolves in the copper reagent only after the addition of an acid. This constitutes the utricular tissue of certain roots, and the epidermal cells of leaves.

(*c*) *Metacellulose.*—Insoluble in the copper reagent even after the addition of acids. It occurs principally in the tissue of Fungi and lichens, and is the "fungine" of Braconnot.

2. *Vasculose.*—This is the substance which enters most largely into the composition of vessels and tracheids. It usually accompanies cellulose substances, but differs from them completely in composition and properties, containing more carbon and less hydrogen. It is the substance which in certain cases unites the cells and the fibers. It sometimes occurs on the exterior of tissues in the form of a continuous, resisting and horny membrane. It forms, in fact, the solid part of woody tissues; it is abundant in hard woods, and in the sclerenchymatous concretions in pears; the shells of nuts and the stones of stone-fruit often consist of this substance to more than half of their weight. Vasculose is insoluble in bi-hydrated sulphuric acid, and in the copper reagent; it does not dissolve sensibly at the ordinary pressure in alkaline solvents, but only with the assistance of pressure. This important property is utilized in the manufacture of paper from straw and wood. It dissolves rapidly in oxidizing substances, as chlorine water, hypochlorites, nitric acid, chromic acid, permanganates, etc. Before dissolving it, oxidizers change it into a resinous acid, soluble in alkalies. Cellulose substances can be removed from vasculose by the solvent action on them of bi-hydrated sulphuric acid, or Schweitzer's reagent. If, on the other hand, these substances have to be freed from vasculose, the tissue is subjected for several hours to the action of nitric acid diluted with its volume of water in the cold, which does not act sensibly on cellulose substances, while it transforms the vasculose into a yellow resinous acid, which can then be dissolved out by means of an alkali.

3 *Cutose.*—This substance constitutes the fine transparent membrane which forms the surface of the aërial parts of plants; the "suberine" of Chevreul is a compound of cutose and vasculose. It possesses several characters in common with vasculose, resisting the action of bi-hydrated sulphuric acid, but it is soluble at the ordinary pressure in dilute or carbonated solutions of potassa and soda. It contains more carbon and hydrogen than vasculose. Subjected to the action of nitric acid it gives rise to suberic acid. To separate cutose from the cellulose substances, and from vasculose, the copper reagent is first used to dissolve the former, and the tissue is then agitated with potassa at the ordinary or at a higher pressure, the former dissolving the cutose, and the latter the vasculose.

4. *Pectose.*—This substance is insoluble in water, but is dissolved by the action of dilute acids, and converted into pectin. It occurs ordinarily in the utricular tissues of roots and fruits, and is recognized by subjecting the tissue with heat to the action of dilute hydrochloric acid; it then forms pectin, which dissolves in the water, and can be precipitated by alcohol.

5. *Calcium pectate.*—This salt is often the basis of a tissue which occurs in the form of a continuous membrane, serving as in the pith of certain trees to bind the cells together. If this salt is decomposed by an acid, the

tissue is immediately disintegrated into its constituent cells. Its determination is effected by heating the tissue in the cold with dilute hydrochloric acid, which decomposes the calcium pectate, leaving the pectic acid in an insoluble state; this is then heated with a dilute solution of potassa, producing a soluble pectate which can be again decomposed by acids.

6. The *Nitrogenous substances* contained in vegetable tissues are dissolved by alkalies.

7. The *Inorganic substances* constitute the ash after calcination.

In woods the proportion of vasculose increases with their hardness and density. The proportions of cellulose and paracellulose vary in stems; pine wood appears to be composed exclusively of paracellulose and vasculose. The parenchyma of the pith often contains considerable quantities of pectose and calcium pectate. Cork consists partly of "suberin," and is composed of cutose and vasculose. In leaves and petals the parenchyma consists of cellulose and pectose, and the vascular bundles and vessels of vasculose and paracellulose. The utricular tissue of petals is composed almost entirely of cellulose, thin spiral vessels almost entirely of vasculose.

Vasculose can be obtained in special purity from the pith of the elder. After treating with dilute alkali it is boiled with dilute hydrochloric acid in order to transform the paracellulose into cellulose; the ammoniacal copper reagent is then used, and the treatment repeated eight or ten times until no further reaction ensues. The pure vasculose thus obtained preserves a light yellow tint, maintaining the structure of the original tissue. The mean of several analyses of vasculose gives a composition corresponding to the formula, $C_{36}H_{20}O_{16}$.—*Amer. Nat.*, July, 1883; from *Jour. Royal Mic. Soc.* for April, 1883.

BASIS OF THERMO-CHEMISTRY.

By L. Meyer.

No simple connected theory of chemical change has hitherto been based on thermo-chemical investigations, notwithstanding their number and the trustworthiness of the constants deduced from them; indeed many chemists would even consider that such a generalization is for the present not ripe for discussion. For although many observations are in direct accordance with the mechanical theory of heat, yet from time to time facts are brought forward apparently in direct contradiction to it; as the validity of this theory cannot be doubted, such discrepancies probably arise from wrong methods of its application. According to the author's opinion, the retention of old and baseless hypotheses hampers the framing of a thermo-chemical theory; such, for example, is the conception that the atoms are particles of mass endowed with a power of attraction through space, although it is at least highly probable that attraction, as we conceive it, is produced by a certain movement of smaller particles, arising from pressure or impact. The satisfaction of these attractions or affinities is not then correlated with a conversion of potential into kinetic energy, but the combinations and also the separations of the affinities are merely a conversion of one form of kinetic energy into another. Again, it is often tacitly

assumed that the atoms are particles at rest, more especially in the more or less established generalization that in absence of disturbing circumstances the final result of a chemical change is the combination of those affinities which evolve the greatest heat in their satisfaction. If, on this assumption, 2 atoms, A and B, are attracted, and, by their mutual impact combine with one another, then their potential energy is converted into kinetic, which either wholly or partially assumes the form of heat. Supposing, then, a third atom, C, whose attraction for A is greater than that of B, to be brought into such a condition that it can oust B, then the kinetic energy evolved as heat is equivalent to the potential energy between A and C diminished by the work done in the separation of A and B. A decomposition of the compound AC by B is practically excluded, and also every chemical change which is associated with a consumption of heat.

But atoms and molecules are not at rest: for, not only is every molecule in motion as a whole, but each of its constituent atoms is likewise moving, the movement of the latter being so far limited that no individual atom can be separated from the others which form the molecule.

The form and force of the movement is dependent on the nature of the substance, temperature, and space occupied by a given quantity of it. Although no ultimate conclusion can be arrived at as to the actual form of the motion, yet it can *à priori* be suspected that it is either of such a kind that the *vis viva* remains the same, or alternately increases and decreases at the expence of the potential energy. The former case would obtain when the several atoms describe a circle around some centre of gravity, the latter when the path described is an ellipse: if the latter represent the form of motion, then the readiness of decomposition of the molecule is dependent on the relative position of the atoms in a given unit of time; and it is thus possible that one and the same compound by the action of one and the same substance is in certain cases decomposed, and in others unaltered without any perceptible difference in the external conditions, especially temperature. Then for the decomposition of a compound AB by C, it is not even necessary that in any given position the attraction between A and B should be less than that between B and C, for it is a possible case that while A and B are indefinitely apart from one another, C strikes with such velocity on A that it ousts B from the sphere of action. Whether, after such a decomposition, the kinetic energy of the system is greater or less than before is dependent upon whether C or B possesses the greater affinity for A, but *for effecting* the decomposition it is not necessary that B should possess the greater, for C can compensate a less degree of affinity by a greater *vis viva*. In accordance with this view not only the decomposition of AB by C, but the re-formation of AB from AC and B is possible. Finally, the possibility and ease of a chemical combination is dependent, not upon the force of the affinities, but upon other properties of atoms and molecules and upon external conditions.

The author also remarks that there is no fundamental distinction between positive and negative heat-change: for the combination of two atoms could scarcely be dissolved without their kinetic energy taking some part in work done in overcoming the affinities, but the loss of energy will be marked by the heat developed in the newly formed affinities. The

final heat-change observed in a chemical reaction is the mixed result of intimately associated circumstances, and does not probably afford a true representation of the energy of the satisfied or dissociated affinities; this change, as also change of volume and refractive index, is dependent not upon the mutual attraction or affinity of the combining substances, but upon their individual nature and their relative quantities.

In conclusion, the author considers that the science of thermo-chemistry requires to be thoroughly reviewed, and the recorded observations, although of manifestly great service, must not be considered as affording a final solution of the problems involved.—*Jour. Chem. Soc.*, Aug., 1883, p. 778.

THIRTY-FIRST ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

FIRST SESSION, *Tuesday, Sept. 11th.*

The Association held its meeting in the spacious lecture-room of the National Museum, located on the grounds of the Smithsonian Institution, Washington, D. C. Adjoining this room were the large halls in which the various exhibits were tastefully arranged. A large number of members were present when President Heinitsh called the meeting to order. The Local Secretary, Mr. Chas. Becker, introduced District Commissioner General West, whose address of welcome was responded to by the President, who afterwards delivered his annual address, in which he alluded to the demise of the venerable Daniel B. Smith and of the eminent scientists Professors Woehler and Draper during the past year, and passed in review the events of the meeting held in the same city a quarter of a century ago. This naturally led to the consideration of pharmaceutical progress in its various phases made in the mean time, of the spread of pharmaceutical organizations throughout North America, and of the changes in the executive management of the Association. The sale of worthless drugs by the Government was severely censured, and various suggestions were made relating to the affairs and interests of the Association. The address, with its suggestions, was then referred to a committee of three for consideration and report.

The list of delegates accredited to this meeting, which had been scrutinized by the Council, was then read. It showed that delegates had been appointed by 11 colleges of pharmacy, 5 alumni associations, 23 State, and 15 county and other local pharmaceutical associations, a total of 54 organizations, of which number, however, only 29 had sent in their credentials two weeks before the meeting as required by the by-laws.

The Secretary of the Council next read the names of 43 applicants for membership, and was followed by Mr. Saunders, who moved that the courtesies of the floor be extended to the officers of the medical departments of the army, navy, and marine hospital service, to the professors of the medical colleges of the District, and to the regents and officers of the Smithsonian Institution.

Invitations were received from the pharmacists of Washington for an excursion to Mount Vernon, and from Mr. C. B. Shafer for visiting a depot of natural mineral waters. The various committee reports were read by title, and Mr. Gordon made a preliminary report for the delegates to the last meeting of the National Wholesale Druggists' Association at Cleveland.

The Nominating Committee was appointed in the usual manner, each accredited delegation naming one member, and in addition thereto the President appointed from the Association at large Messrs. E. Scheffer, of Kentucky; J. H. Redsecker, of Pennsylvania; J. Bassett, of New Jersey; A. R. Bayley, of Massachusetts; and R. England, of Pennsylvania. The Chair also appointed Messrs. W. J. M. Gordon, of Cincinnati; J. A. Milburn, of Washington, D. C; W. J. Jenks, of Philadelphia; N. A. Kuhn, of Omaha; and T. Whitfield, of Chicago, the Committee on Exhibits.

Mr. Kennedy read the minutes of the Council meetings held during the past year, which were approved; and, on motion of Mr. Ebert, the thanks of the Association were tendered to the Council. The report of the Publishing Committee, giving the cost of publishing the last volume of Proceedings and the stock on hand, was read; likewise the introduction to the report on the Progress of Pharmacy, and the report of the Committee on Legislation. The latter referred to the repeal of the obnoxious law of Pennsylvania imposing a special tax for the privilege of selling patent medicines, and of the San Francisco pharmacy act, the opposition to which seems to have arisen chiefly in consequence of the annual registration required, and to have been successful under the plea that the new constitution forbids the enactment of local laws; the new pharmacy law for Delaware, and a recent amendment to the West Virginia pharmacy act were explained, and both laws reported in full. The proposed law giving a military rank to apothecaries of the army and navy was likewise discussed.

After an appeal by Mr. Ebert for abolishing the legal recognition of all diplomas in the registration of pharmacists, the Association adjourned.

SECOND SESSION, *Wednesday Morning, Sept. 12th.*

After the reading and approval of the minutes of the first session and of the Council meeting, the Nominating Committee reported the following nominations: For President, Wm. S. Thompson, Washington, D. C.; for Vice-Presidents, Chas. Rice, New York, Fred. H. Masi, Norfolk, Va., and Edward W. Runyon, San Francisco, Cal.; for Treasurer, Chas. A. Tufts, Dover, N. H; for Permanent Secretary, J. M. Maisch, Philadelphia; for Reporter on Progress of Pharmacy, C. L. Diehl, Louisville; for Council, unexpired term of W. S. Thompson to 1885, Albert E. Ebert, Chicago, and for the term 1883–1886, J. P. Remington, Philadelphia, G. W. Kennedy, Pottsville, Pa., and H. J. Menninger, Brooklyn; for Committee on Drug Market, Wm. A. Gellatly, New York, E. W. Cutler, Boston, M. N. Kline, Philadelphia, D. Myers, Cleveland, Wm. Simpson, Raleigh, N. C.; for Committee on Papers and Queries, J. U. Lloyd, Cincinnati, G. W. Sloan, Indianapolis, Wm. W. Bartlet, Boston; for Committee on Prize Essays, C. L. Diehl, Louisville, A. W. Miller, Philadelphia, E. Scheffer, Louisville; for Committee on Legislation, J. M. Maisch, Philadelphia, S. A. D. Shep-

pard, Boston, E. Bocking, Wheeling, W. Va. All the nominees were elected, and the President and First Vice-President elect installed to their offices.

On motion of Mr. Menninger, it was resolved to hold an afternoon session, in view of the large amount of work laid out and of the inclemency of the weather. Twenty-two propositions for membership were next reported, after which the Treasurer read his annual report, showing the cash balance on hand to be $4,196.58 (against $1,981.10 in 1882), and in addition thereto $682.43 in the Ebert fund, $1,282.76 in the Centennial fund, and $904.38 in the life membership fund. The report likewise suggested that the various sums donated in small amounts to the Association in past years be ascertained, with the view of adding the money to one of the permanent funds. The Treasurer was directed to report on this subject next year.

The chairman of the Council Committee on Membership reported the names on the roll of active members to number 1,386, and honorary members, 31. The loss by death during the past year was 1 honorary and 18 active members.

The Committee on Prize Essays recommended to award the Ebert prize for 1882 to Prof. J. U. Lloyd, of Cincinnati, for his lucid explanation and practical illustration of the formation of precipitates in fluid extracts. The report was adopted.

Mr. T. Roberts Baker read the report of the committee appointed to ascertain the feasibility of holding a meeting in California in the near future. Only about one-half of the members east of the Rocky Mountains had replied to the committee's inquiries; of this number 88, or nearly 14 per cent., signified their intention of attending the meeting, while 84, or fully 13 per cent. of the answers left this doubtful. The report on the inquiries made at the Pacific coast did not appear to be very encouraging, since only 11 per cent. of those addressed deemed the matter important enough for answer; of these, however, fully two-thirds (34) favored the project, 8 promising to read papers. The estimate of attendance from the Pacific Coast was between 125 and 150. From a letter written by Prof. Searby it appears, on the other hand, that few, if any, of the San Francisco pharmacists and druggists had been applied to, and that these are all in favor of holding a meeting there. Prof. Painter stated that the estimated cost of attendance ($500) was too high, and that for a three weeks' trip it need not exceed $300, or at most $350. The report stated that, in the opinion of the committee, it was not deemed desirable to hold a meeting in California within the next three years. The report was accepted, the committee discharged, and on motion of Mr. Holmes, from Washington Territory, another committee of five was directed to be appointed to report further next year.

An invitation from the Orleans Pharmaceutical Association to meet in New Orleans in the spring of 1885, was received with thanks and referred to the Committee on the time and place of next annual meeting, consisting of Messrs. J. T. Shinn, Philadelphia; John Ingalls, Georgia, and A. E. Ebert, Chicago.

Mr. Gordon reported verbally for the Committee appointed last year to attend the meeting of the Western Wholesale Druggists' Association at Cleveland, and Mr. Sloan read the report of the Committee on the drug

market, giving the variation of prices of the most important drugs during the year, and the changes in the rates of duties on drugs, etc., under the new tariff, which took effect July 1st.

The Association then paid an official visit to the exhibition room, and afterwards adjourned.

THIRD SESSION, *Wednesday Afternoon, Sept. 12th.*

A motion made by Mr. Colcord that the Committee on Legislation be instructed to ask an appropriation of $25,000 of the general government to be expended under the direction of the Commissioner of Agriculture for the introduction and cultivation of foreign medicinal plants and for the better protection of our indigenous medicinal plants, was referred to the Council to inquire into the subject, and with power to act.

The first paper read was by Prof. Prescott on *the quality of commercial iodide of potassium* (see page 497), and elicited considerable discussion. Prof. Markoe stated that in New England potassium iodide is frequently prescribed with syrup of iodide of iron, and that the slight alkalinity of the salt is the source of annoyance and trouble in this combination. It was stated that manufacturers were compelled to crystallize the salt from an alkaline solution in order to supply opaque crystals as demanded by the consumers, and that an attempt made some years ago in Great Britain to introduce the pure salt in transparent crystals had not met with success. While pure potassium iodide, if kept dry, would remain unaltered, the neutral salt contaminated with some chloride, was said to attract moisture and become discolored from free iodine. The prescribing of this iodide with alkaloidal salts or with preparations containing alkaloids, was referred to as the cause of precipitates, more particularly if combined with mercuric iodide, and of possibly serious consequences to the patient. Although the samples of the salt examined showed the commercial article to be of very fair quality, it was contended that the rigid application of pharmacopœial tests would tend to still further improve its purity which was deemed to be entirely feasible.

Mr. Seabury read a lengthy report of the Entertainment Committee, at the conclusion of which various motions and counter-motions were made, and after a good deal of discussion it was decided to accept the report, to lay a motion to discharge the committee on the table, to order the balance of the entertainment fund of 1882, amounting to $224, to be paid over to the present committee, and to refer the committee's suggestions to the Committee on the President's Address. The Association then adjourned until 9 o'clock on Thursday morning.

FOURTH SESSION, *Thursday Morning, Sept. 13th.*

After the reading of the minutes a motion was made to adjourn until afternoon, in conformity with the programme laid out by the Entertainment Committee; the motion was not seconded. On motion of Mr. Diehl, seconded by Mr. Rice, it was resolved that hereafter all business pertaining to entertainment be referred to the Council without further discussion.

A letter was read from the proprietors of Fort William Henry Hotel, Lake George, inviting the Association to meet there, and offering special inducements; it was referred to the Committee on the next meeting.

Mr. Kennedy read a paper on *oil of birch bark and oil of winter green*, in which he briefly reviewed the chemical history of these oils and the results of Mr. Pettigrew's investigation (see *Amer. Journ. Pharm.*, Aug., 1883, p. 385), and described the manufacture as carried on in Schuylkill County, Pa. (*Ibid.*, Feb., 1882, p 49). At the suggestion of Prof. Maisch the author had made further inquiries and ascertained that of the oils only that portion is collected which sinks to the bottom of the watery distillate while the "light oil" or "light ring" floating on the surface is permitted to run off with the water, but this is collected in barrels to be used again for the next lot of material. It is difficult to comprehend, from the author's description, given in outline, why the light oil should not accumulate so as to attract attention; but from some verbal remarks made by Mr. Kennedy, it appears that a considerable portion of this light oil ultimately subsides. Mr. Kennedy's paper also states that 100 lbs. of old gaultheria leaves from plants which had not been previously picked yield about 12 oz., while from plants that had been picked, the spring leaves yield about 14 oz., and the autumn leaves as much as a pound. This is about double the yield previously reported by Mr. Underhill (*Ibid.*, April, 1883, p. 197). The oils of betula lenta and of gaultheria, made in Pennsylvania, are usually mixed. The Counties of Carbon and Monroe are reported to have produced in 1882 not less than twenty tons of oil, about 40 per cent. of which was oil of birch; Bradford, Sullivan and Susquehanna Counties make about two tons, including 20 per cent. of oil of gaultheria, and Schuylkill County about 1,000 lbs., of which about 10 per cent. is oil of gaultheria.

Prof. Maisch thought that nothing short of actual analysis could prove the presence or absence of terpene in the distillate from birch bark, in which the oil does not pre-exist, but is formed by a decomposition in the presence of water. That the hydrocarbon which presumably exists in gaultheria, is not collected, he had reason to believe, from correspondence with one or two manufacturers of oil of gaultheria, who stated that they had not observed the separation in the distillate of a light oil. This rejection at the present time of the light oil seemed to indicate that the oil differed somewhat from that sold thirty or forty years ago, and would also explain why Mr. Lloyd, in preparing salicylic acid from the commercial article, failed to observe a hydrocarbon (*Ibid.*, 1879, p. 18). Prof. Lloyd stated that occasionally he had met with samples from which a light oil could be obtained (*Ibid.*, 1875, p. 343). Prof. Diehl called attention to the evident empyreumatic odor of one of Mr. Kennedy's samples, due doubtless to carelessness in distillation. Prof. Maisch stated that judging from other samples there was a slight but noticeable distinction in the odor, that of gaultheria oil being more delicate.

A paper *on quinine pills* by Mr. Virgil Coblentz was read, 1, 2, 3 and 5 gr. pills having been examined from 18 different manufacturers. The pills were mixed with lime, the mixture dried, exhausted with ether and the alkaloid weighed; the sulphate was calculated with $8H_2O$ which is permitted

by the new pharmacopoeia. The pills from 14 manufacturers were found to be of full weight and with the hydration calculated generally showed an excess in weight ranging from 1 to 7 per cent., apparently proving that a more or less effloresced salt had been used. The amount of quinine, estimated by the herapathite test showed the salt to be good commercial sulphate as compared with quinine sulphate of American manufacture. The pills of one manufacturer were correct except the 1 grain pills which were 6 per cent. short, and the pills of the remaining three manufacturers were all under weight varying from 6 to 32 per cent., the quinine being at the same time mixed with other cinchona alkaloids, in one case with over 30 percent. Mr. Coblentz states that of the four makers of these pills, though not widely known, all have "always had a very unsatisfactory reputation as to their integrity."

In commenting on this paper Mr. Parsons, stated that in the examination of over 1,000 different samples of quinine, he had found but 3 or 4 which contained 8 molecules of water; quinine of American and foreign manufactures contained pretty uniformly 7, and perhaps quite as often only 6 molecules; the manufacturers should therefore be entitled to no more than 7. Regarding DeVrij's process he considered it probably as the best for the estimation of quinine; but it was nevertheless likewise a dangerous one, in as much as apparently slight deviations would considerably reduce the results. In extracting the alkaloid, notably when decomposing the solution with ammonia, minute quantities of glucose and other foreign matters would be dissolved; the difference between the first weighing and the results from herapathite should therefore not be charged to foreign alkaloids, unless the nature be shown.

Professor Prescott reviewed the different tests which had from time to time been proposed for quinine sulphate, and argued that the only just criterion of the purity of this salt, whether examined by itself or in pills, was the tests laid down in the pharmacopoeia.

Advertisements having been distributed in the meeting room, the further distribution of such matter was, on motion of Mr. Vogeler, prohibited.

Professor Oldberg next read a paper *on specific volumes*, which term the author proposes for the relative volume of a liquid as compared with the volume of an equal weight of water, or in other words the volume of one gram of a liquid stated in cubic centimeters. The paper is accompanied by the following table giving the relative weight (specific gravity), weight of 1,000 cubic centimeters in grams, weight of 100 U. S. fluidounces in avoirdupois ounces, relative (or specific) volume, volume of 1,000 grams in cubic centimeters and volume of 100 ounces avoirdupois in U. S. fluidounces, of a large number of pharmacopœial liquids. The usefulness of such a table, furnishing as it does at a glance the relation of weight to bulk and vice versa is quite apparent. Dr. Rice stated that a somewhat similar table was in course of preparation for the new pharmacopœia and would soon be published.

Table of Specific Gravities and Specific Volumes of some Liquids.

LIQUIDS.	WEIGHTS.			VOLUMES.		
	Specific Weight (Water 1 sp. gr.)	Weight of 1,000 C.C. grams.	Weight of 100 U.S. fl. ozs. in av. ozs.	Specific volume (water 1).	Volume of 1,000 gm. in C. C.	Volume of 100 av. ozs. in U.S. fl. ozs.
Acid. Acet. U.S.	1·0480	1048·	109·1	·954	954·	91·6
Acid. Acet. Dil. U.S.	1·0083	1008·3	105·0	·972	972·	95·2
Acid. Hydrobrom, 34 per cent.	1·303	1303·	135·7	·767	767·	73·6
Acid. Hydrobrom. Dil. U.S.	1·077	1077·	112·2	·928	928·	89·1
Acid. Hydrochlor. U.S.	1·160	1160·	120·8	·862	862·	82·8
Acid. Hydrochlor. Dil. U.S.	1·049	1049·	109·3	·953	953·	91·5
Acid. Lactic. U.S.	1·212	1212·	126·2	·833	833·	80·
Acid. Nitric. U.S.	1·420	1420·	148·	·704	704·	67·6
Acid. Nitric. Dil. U.S.	1·059	1059·	110·3	·944	944·	90·6
Acid. Oleic. U.S.	0·800	800·	83·3	1·250	1250.	120·
Acid. Phosphoric. U.S.	1·347	1347·	140·3	·742	742·	71·2
Acid. Phosphoric. Dil. U.S.	1·057	1057·	110·1	·945	945·	90·7
Acid. Sulphuric. U.S.	1·840	1840·	191·7	·543	543·	52·2
Acid. Sulphuric. Dil. U.S.	1·094	1094·	114·	·914	914·	87·7
Aether, U.S.	0·750	750·	78·1	1·333	1333·	128·0
Aether Fortior, U.S.	0·725	725·	75·5	1·379	1379·	132·4
Alcohol, U.S. (At 15° 6′ C. = 60° F.)	0·820	820·	85·4	1·219	1219·	117·
Alcohol, U.S. (At 25° C. = 77° F.	0·812	812·	84·6	1·231	1231·	118·1
Alcohol Dil. U.S. (At 15° C. = 60° F.)	0·928	928·	96·7	1·077	1077·	103·4
Alcohol Dil. U.S. (At 25° C. = 77° F.)	0·920	920·	95·8	1·087	1087·	104·4
Aqua destillata	1·000	1000·	104·17	1·000	1000·	96·0
Aqua Ammoniæ. U.S.	0·959	959·	99·9	1·043	1043·	100·1
Aqua Ammoniæ. Fortior. U.S.	0·900	900·	93·75	1·111	1111·	106·7
Benzinum. U.S.	0·670	670·	69·8	1·493	1493·	143·3
Carbonei Bisulphidum. U.S.	1·272	1272·	132·5	·786	786·	75·5
Chloroform. Purific. U.S.	1·488	1488·	155·	·672	672·	64·5
Chloroform. Venal. U.S.	1·470	1470·	153·1	·680	680·	65·3
Glycerinum, U.S.	1·250	1250·	130·1	·800	800·	76·8
Liquor Ferri Acet. U.S.	1·100	1160·	120·8	·862	862·	82·8
Liquor Ferri Chloridi, U.S.	1·405	1405·	146·4	·711	711·	68·3
Liquor Ferri Tersulph. U.S.	1·320	1320·	137·5	·757	757·	72·7
Liquor Potassæ, U.S.	1·036	1036·	107·9	·965	965·	92·6
Liquor Sodæ, U.S.	1·059	1059·	110·3	·944	944·	90·6
Mel	1·333	1333·	138·8	·750	750·	72·0
Oleum Adipis	0·900	900·	93·75	1·111	1111·	106·7
Ol. Amygd. Express	0·917	917·	95·5	1·091	1091·	104·7
Ol. Auranti Cort.	0·860	860·	89·5	1·163	1163·	110·6
Ol. Bergamii	0·875	875·	91·1	1·143	1143·	109·7
Ol. Caryophylli	1·050	1050·	109·4	0·952	952·	91·4
Ol. Copaibæ	0·890	890·	92·7	1·123	1123·	107·8
Ol. Cubebæ	0·920	920·	95·8	1·087	1087·	104·4
Ol. Eucalypti	0·900	900·	93·75	1·111	1111·	106·7
Ol. Gaultheriæ	1·173	1173·	122·2	·852	852·	81·8
Ol. Gossypii Seminis	0·925	925·	96·4	1·081	1081·	103·8
Ol. Lavandulæ	0·890	890·	92·7	1·123	1123·	107·8
Ol. Limonis	0·850	850·	88·5	1·176	1176·	112·9
Ol. Lini	0·936	936·	97·5	1·068	1068·	102·5
Ol. Menth. Pip	0·900	900·	93·75	1·111	1111·	106·7
Ol. Morrhuæ	0·920	920·	95·80	1·087	1087·	104·4
Ol. Olivæ	0·916	916·	95·4	1·092	1092·	104·8
Ol. Ricini	0·960	960·	100·0	1·042	1042·	100·0
Ol. Rosmarini	0·900	900·	93·75	1·111	1111·	106·7
Ol. Sassafras	1·091	1091·	113·6	·917	917·	88·0
Ol. Sesami	0·918	918·	95·6	1·089	1089·	104·5
Ol. Terebinthinæ	0·862	862·	89·8	1·160	1160·	111·4
Spir. Aetheris Nitros. U.S.	0·824	824·	85·8	1·214	1214·	116·5
Spir. Frumenti	0·920	920·	95·8	1·087	1087·	104·4
Spir. Vini Gallic	0·930	930·	96·9	1·075	1075·	103·1
Syrupus, U.S.	1·310	1310·	136·4	·763	763·	73·3
Tinct. Ferri Acet. U.S.	0·950	950·	98·9	1·052	1052·	101·1
Tinct. Ferri Chlorid. U.S.	0·980	980·	102·1	1·020	1020·	98·0
Vinum Album, U.S.	1·000	1000·	104·17	1·000	1000·	96·0
Vinum Rubrum, U.S.	1·000	1000·	104·17	1·000	1000·	96·0

A paper by Prof. Lloyd, entitled *Precipitates in fluid extracts, tinctures, etc.*, was read in continuation of papers read at two previous meetings. The present paper discusses the formation of precipitates, or rather the separation of solid or liquid matter upon or above the surface of the liquids named. In connection with this subject are considered the evaporation of liquids below their boiling points and in open and in partly filled bottles, the disturbance of the solvent power of the remaining solution in consequence thereof, the capillary attraction by the film deposited on the upper edge of the liquid, the effect of partial or one-sided heating and other influences upon volatile liquids. The importance of these investigations was forcibly shown by the results of an experiment, in which a bottle containing potassium iodide was half-filled with alcohol, hermetically closed, and moderately heated on one side, when after some time an incrustation of salt was found above the liquid which for solution would have required 1¼ times the entire amount of alcohol within the bottle. Dr. Rice considered these observations and results not only as being very interesting, but likewise as being of great importance in explaining scientific facts. Mr. Shinn thought that the pharmaceutical moral conveyed could be expressed by "shake the bottle." Mr. Halberg referred to the effect of light, having observed that liquids containing chlorophyll and tannin form such deposits more readily when exposed to light than in the dark. Dr. Ziegler suggested that such precipitates might be occasioned not solely by deposition from solution, but also by a chemical change more or less influenced by light.

Mr. Shinn read the report of the Committee on the President's Address and presented a series of resolutions. The subjects of a national pharmacy act and of elevating the condition of apothecaries in the army and navy were referred to the Committee on Legislation, and the Council was charged with the appointment of suitable delegates to the International Pharmaceutical Congress to be held at Brussels; with taking proper action against the sale by Government of drugs and medicines condemned by drug examiners, and with the appointment and supervision of a committee of arrangements and entertainment. The suggestions of the present entertainment committee were likewise referred to the Council who was also authorized to accept or decline any invitation which may be extended to the Association for its entertainment during the time of meeting.

Mr. Thompson offered the following resolution, seconded by Mr. Vogeler, which was adopted:

Resolved, That the National Museum is hereby declared to be the depository of specimens of the American Pharmaceutical Association; that all specimens of materia medica, chemistry and pharmacy coming into possession of this Association shall be deposited in said museum and be designated as the Collection of the American Pharmaceutical Association; that our members are recommended to contribute towards the completion of the collection, and that a committee of three be appointed to receive specimens for this collection.

The subject of badges to be used at the annual meetings was referred to the Council, and the receiving by Council of credentials of delegates from the Missouri and Rhode Island Pharmaceutical Associations was reported, after which the Association adjourned until 3 o'clock in the afternoon.

FIFTH SESSION, *Thursday Afternoon, Sept. 13th.*

The session was opened with the reading of the minutes of the preceding session and of the Council meeting, and with the proposition of 17 applicants for membership. The Committee on Exhibits made a partial report, and was granted time to finish it for publication.

Mr. Gordon read a paper on *the production of bromine in the United States.* The annual yield is 450,000 to 500,000 lbs., divided as follows: Allegheny river, Pa., 70,000 lbs.; Clifton, Macon City, and Hartford City, W. Va., 110,000 lbs.; Middleport, Pomeroy, and Coneport, O., 130,000 lbs.; Kanawha river, W. Va., 45,000 lbs.; Canal Dover, 30,000 lbs., and Midland and St. Louis, Mich., 100,000 lbs.

Mr. Kennedy read a paper on *the asserted presence of magnesium sulphate in cinchonidine sulphate*, and reported that samples of cinchonidine from the four American manufacturers had been found free from the impurity.

Two papers on *Stathmetometric or Stathmetic Analysis* were read, one by Prof. W. W. Bartlet, the other by Mr. A. B. Taylor, both papers advocating in favor of this method, as being not only available, but superior to the volumetric method, on account of greater accuracy, for the reason that the result is not affected by the expansion or contraction through changes of temperature. The method resembles volumetric analysis, but the test solutions are brought to a definite weight instead of measure, and the amount of test liquid used for analysis is likewise weighed.

Mr. Rice acknowledged the greater accuracy and also the usefulness of this method, but considered the volumetric method as rather more convenient, if care be taken to prepare all volumetric test liquids at the same temperature and afterwards preserve them under identical conditions as regards temperature. While the ratio of expansion and contraction of these liquids was doubtless not absolutely identical, yet the differences were so slight that they might be disregarded. Every stathmetometric analysis required three weighings, against one by the volumetric method; the former, moreover, necessitated the use of more accurate balances. At present there was very little difficulty of obtaining accurate burettes. Prof. Bartlet again referred to the advantages of the method and said that scales sensitive to 1 milligram should be found in every store. Prof. Parsons prefers the volumetric method as being more expeditious and, with ordinary care, equally good; the success of both depends upon personal skill and attention.

A paper by Mr. Wm. M. Thomson was read on *an improved process with apparatus for manufacturing fluid extracts on a large scale.* The apparatus consists of three chambers, the upper one constituting the reservoir. In this a vacuum is created, the menstruum is then drawn in, afterwards subjected to a pressure of 3 or 4 atmospheres and retained under compression until required. The middle vessel is the percolator in which the properly moistened material is packed between two diaphragms and macerated with menstruum in a partial vacuum. The lower vessel is the receiver, and before being put in operation a vacuum is produced therein. After sufficient maceration of the drug, communication between the three chambers

is opened, when percolation immediately begins, the liquid being forced through the drug under considerable pressure, this being exerted not directly upon the drug but upon a column of liquid intervening between the drug in the percolator and the compressed air in the reservoir. The operation may also be reversed and the percolation proceed upward, when the lower chamber will be the reservoir and the upper chamber the receiver. The apparatus is like the one figured in this JOURNAL, 1882, page 237, with a third chamber, the reservoir, placed on top of the percolator.

On the mashing, fermenting, and distillation of grain into whisky is the title of a paper by Mr. Ch. K. Gallagher, of North Carolina, describing apparatus and process with many practical hints; it is not well adapted for an abstract. A discussion followed, touching upon the purification of whisky from fusel oil by potassium permanganate and unslaked lime. Mr. Ebert stated that treating the farinaceous matter with sulphuric acid would increase the yield of whisky, but it was very impure; at present a process giving a larger yield was much used, in which the starch was "cooked" under a pressure of 80 to 100 pounds, and thus converted into fermentable sugar. The changing of fusel oil in whisky by electricity had been experimented with by the electrician of the Chicago Fire Department in 1871, and such a process had been recently patented in France. Prof. Prescott stated that fusel oil was best removed by fractional distillation or by charcoal, and that, in his opinion, the effect of permanganate upon it had been over-estimated.

Mr. Sloan read a paper upon *the keeping qualities of snow-water*, and proved by experiments that it is not the month of the year but the condition of the atmosphere at the time of the falling of the snow to which must be attributed the variation in snow-water; for it was shown that when the atmosphere had been previously washed by rain just preceding the snow, the water from that snow shows a minimum of impurities; the month of April probably gives the phenomenon of rain changing into snow more frequently than other months.

The Chair appointed Messrs. J. A. Milburn, Washington, D. C.; H. B. Parsons, New York, and Joseph Roberts, Baltimore, the Committee on Specimens for the National Museum.

The amendments to the By-laws proposed last year were called up. The one offered to Chapter VIII, Article IV, providing that members dropped for non-payment of dues, should not be restored to the roll until they have paid back dues for three years, was laid upon the table. The amendment to Chapter VIII, Article VI, providing that no one who has been expelled shall be received as a delegate, and that no one dropped from the roll for non-payment of dues shall be reinstated by virtue of being a delegate, was carried.

The report of the committee on the next annual meeting was received amended, and adopted. The next meeting will be held at Milwaukee, Wis., and the time was at first fixed for the second Tuesday of September, but was subsequently reconsidered, and the last Tuesday of August 1884 agreed upon.

Mr. Colcord moved that a committee of ten on unofficinal formulas be

appointed to arrange such formulas as would be of practical benefit to the pharmacists of the country, to be known as the unofficinal formulas of the American Pharmaceutical Association. The motion was adopted.

A resolution offered by Mr. Kennedy, declaring the refusal of manufacturers of patent medicines to abate prices after the repeal of the stamp law to be unwise, impolitic, and an act of injustice to the people and of bad faith to the Government, was, on motion of Mr. Doliber, indefinitely postponed by a vote of 26 ayes to 20 nays.

The Association then adjourned until Friday morning.

SIXTH SESSION, *Friday Morning, Sept. 14th.*

Mr. John R. Drake, of Milwaukee, was elected Local Secretary for the ensuing year. Two candidates for membership were reported.

Professor Wheeler read a paper *On the Citrate of Caffeine in the American Market.* Samples from three manufacturers could only be procured, and these contained respectively 63.5, 81.1, and 96.53 per cent. of caffeine while according to calculation the three possibly existing citrates would contain 71.6, 67.1, and 50.3 per cent. of the alkaloid. A microscopic examination showed the three commercial citrates to be simply mixtures of caffeine and citric acid.

A paper on *Petrolatum in the Officinal Ointments* by Prof. Remington was read (see page 487), and somewhat discussed as to the quality of commercial petrolatum, and the difficulty of making a uniform product of higher melting point by combining it with hard paraffin; the superiority of oleates in being absorbed was likewise referred to. Mr. George stated that ointments of cantharides, nutgalls, belladonna, and others, made with petrolatum had been found to be far inferior to those made with lard. Mr. Eliel referred especially to iodine, which develops a very objectionable odor with soft paraffin.

Mr. Cowdrey read a paper entitled *Who is responsible for adulteration?* The writer adopts the views of Judge Cowing, of the Supreme Court of Illinois, that he who adulterates should be punished, not the seller; but in the opinion by Judge Cowing particular stress was laid upon the fact of absence of criminal intent or culpable negligence on the part of the seller, and that in the case cited the adulterated article, cream of tartar, had been bought in the open market, the highest price paid for it, and the "best article asked for"; in other words, the druggist had been cheated by the manufacturer, upon whose integrity he relied.

A paper by Mr. Wm. M. Thomson, entitled *Laboratory Notes*, described a process called *sectional percolation;* the apparatus is a somewhat conical percolator, made in sections, each one nearly filled with moistened powder; the liquid percolating through is at the exit from each section distributed over the surface of the contents of the next section, the aim being to keep the powder covered with liquid. The author has made serviceable and durable *gaskets* by forming rubber steam hose into a ring of suitable size, and compressing this gradually until flat.

Mr. Lloyd likewise uses rubber hose for similar purposes, but does not

press it flat; the weight of the head or lid is usually sufficient to make a tight joint by somewhat compressing the hose.

Prof. Lloyd's paper on *Extract of Malt* (see page 484) elicited the remark from Mr. Ebert, that extract of malt as originally understood contained no diastase and was intended only to be a vehicle similar to other saccharine liquids. The presence of diastase was a quite recent requirement, and as the process recommended by Prof. Lloyd could be without difficulty used by pharmacists, further observations were deemed desirable by several members.

Mr. Feemster's paper on *Caffeine in Commercial Powdered Guarana* is a continuation of the subject reported on last year. The amount of caffeine in five samples varied between 4·3 and 5 per cent., the average being 4·72 per cent., or somewhat higher than the crude guaranas previously examined, which is possibly due to the drying of guarana before powdering.

Pharmaceutical Notes, by J. W. Colcord, discussed *the styptic effects of the leaves of Plantago major*, which are regarded as being of sufficient value to demand attention. *Thapsia plaster* was found very serviceable when used as a bandage in several painful affections. *Glycerin* was found very useful for preventing crystallization in strained honey, one ounce being used for 1½ lb. of honey.

A paper by C. W. Phillips on the *nature of the precipitate in tincture of Boletus laricis*, accompanied by microscopical drawings, is a preliminary report, which will be followed by further investigations to be reported next year. The paper gives a pretty complete history of the chemical investigations of this drug.

The Committee on Unofficinal Formulas was constituted as follows: J. W. Colcord, Lynn, Mass.; Jas. T. Shinn, Philadelphia; Chas. Becker, Washington; S. A. D. Sheppard, Boston; C. L. Keppler, New Orleans; N. H. Jennings, Baltimore; J. D. Wells, Cincinnati; A. Vogeler, Chicago; Emlen Painter, San Francisco; W. H. Alexander, St. Louis.

A committee of five was directed to be appointed to visit the Wholesale Druggists' Association at the meeting in New York.

Resolutions of thanks were offered and passed to the Officers and Council; to the Local Secretary, Mr. Chas. Becker; to the Committee on Entertainment; to Prof. F. W. True, Acting Director of the National Museum; to Dr. J. M. Flint, Superintendent of the Department of Materia Medica; to the Press, and to the pharmacists of Washington and their ladies.

The Association then adjourned, and in the afternoon embarked on the steamer "Mary Washington," for a sail on the Potomac river and a visit to Mount Vernon, the entertainment having been tendered by the pharmacists of Washington.

MINUTES OF THE COLLEGE.

The semi-annual meeting of the College was held September 24th, 1883, at the College Hall, on Tenth street. Dillwyn Parrish, President, occupied the chair. 22 members were in attendance.

The minutes of the meeting in June last were read, and, on motion, adopted.

Wm. C. Bakes, Secretary of the Board of Trustees, read the minutes of the Board since the last stated meeting of the College, which were, on motion, approved.

These minutes call attention to a resolution, which after some discussion in the Board, was referred to the College for consideration. The resolution was as follows:

"*Resolved*, That the members of the College, at their semi-annual meeting, consider the propriety of adopting some form of preliminary examination of matriculants as a test of competency."

The matter was taken up at once, and a discussion ensued. Mr. Blair thought the matter an important one, and advocated a good English education as being necessary to admission as an apprentice to the drug business.

Mr. Procter also thought it advisable to exact a strict examination from all apprentices before entering upon their duties, which would raise the standard of competency.

Professors Maisch, Remington and Sadtler, Messrs. Bullock, Thompson, Murray, and others participated in the discussion, giving their views at length, and all agreeing that a preliminary examination as to the education of a student by his preceptor before commencing his profession as a pharmacist was highly desirable, but as no way seemed to present itself in the form of a resolution or recommendation, the subject was referred back to the Board of Trustees for their consideration and decision.

The resignation of Professor Frederick B. Power as a member of the College, in a communication to the Board of Trustees, was read by William C. Bakes, and, on motion, accepted.

A letter to Samuel S. Bunting, Treasurer, from Charles L. Mitchell, resigning his membership in the College, was also read, and, on motion, accepted.

Professor Maisch, Chairman of the Committee on Honorary and Corresponding Members, stated that the Committee had the matter before them and had made some progress, but were not yet ready to make a report. He moved that the subject be referred to the Board of Trustees for final action, and that the Committee report to that body hereafter. The motion was adopted.

Alonzo Robbins, Chairman of the Delegation to attend the Annual Meeting of the American Pharmaceutical Association, held in Washington, D. C., commencing September 11th, made the following report:

To the Philadelphia College of Pharmacy:

The undersigned, in behalf of the delegates elected to attend the meeting of the American Pharmaceutical Association, at Washington, D. C., respectfully reports as follows:

Owing to the central location and many attractions of the place of meeting, the attendance was very large, but only a few more than eighty new members were obtained, a number little in excess of the number lost from the roll by various causes.

The sessions were held in the lecture hall of the National Museum, and an unusually large number of valuable and interesting papers were read and discussed.

Mr. William S. Thompson, of Washington, was elected President for the ensuing year.

The Association adjourned on Friday morning, September 14th, to meet at Milwaukee, Wis., on the last Tuesday in August, 1884.

An invitation was received to hold the meeting of 1885 in the City of New Orleans, and while no official acceptance of the invitation could be given by the Association, there was found to be a general opinion among the members present, that it would be advisable to hold the annual meeting of that year in April or May, at that city.

Previous to the meeting of the Pharmaceutical Association, a convention was held and the organization of a National Retail Druggists' Association, for the regulation of trade affairs exclusively, was accomplished, and an executive committee elected to arrange and carry out such plans as may best realize the objects of this new and much needed association.

After the adjournment, an excursion to Mount Vernon, tendered by the pharmacists of Washington, was participated in by a very large number; it passed off in a most delightful manner, and formed a fitting termination to one of the most successful meetings of the American Pharmaceutical Association.

Respectfully submitted,

ALONZO ROBBINS, *Chairman.*

The report of the Delegates to the Convention of Teaching Colleges, made by Professor Remington and another member of the delegation, was to the following effect: That but few of the Colleges were represented in the convention. Delegates were present from the Massachusetts, Chicago, Louisville and Philadelphia Colleges.

The matters discussed were merely recommendatory, and not binding on any of the Colleges.

A discussion whether the course of instruction in the various Colleges should be extended from five to six months, resulted in the proposition being laid on the table.

On the subject of auxiliary instruction it was moved and carried that quiz masters be recommended in all cases where practicable. The Chicago College have adopted an examination at the end of every five lectures, to be written out, and the result preserved and taken into account at the final examination.

The subject of preliminary examination being before the convention, it was, after discussion, recommended that a certificate of a grammar school or an examination equal to it before matriculation to the junior course be required, and that the matter be presented to all the colleges, with a recommendation that it be put into operation in 1885.

A discussion on the subject of an abolition of the thesis as an element in graduation was participated in, some delegates advocating that the satisfactory results of laboratory practice should be accepted in lieu thereof.

Two queries were submitted for the consideration of the convention next year, which will be sent to the various colleges for their consideration.

Samuel F. Troth sent in his resignation as Recorder of the College, which was read by the President, and, on motion, accepted. The resignation was accompanied with the record, which has been carefully and correctly kept by Mr. Troth from the commencement of the institution until the present time, and is a valuable acquisition to the College.

On motion of Mr. Bullock the thanks of the College were ordered to be presented to Samuel F. Troth for the faithful manner in which he has ever served its interests.

A motion that William C. Bakes be requested to act in the future as Recorder in the place of Samuel F. Troth was adopted.

This being the semi-annual meeting, an election for three Trustees, and one to fill the unexpired term of F. B. Power, resigned, was ordered by the President, who appointed Messrs. Andrew Blair and J. W. Worthington tellers. A ballot being taken, the tellers reported the following gentlemen elected for three years, viz.: Alonzo Robbins, Edwin M. Boring, William McIntyre, term ending Sept., 1886; and for the unexpired term of Prof. Frederick B. Power, resigned, Wallace Procter, term ending March, 1885.

Then, on motion, adjourned.

WILLIAM J. JENKS, *Secretary.*

EDITORIAL DEPARTMENT.

THE MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION has been a success in more than one respect. Not only was it the largest meeting ever held by the Association, with the sole exception of the one held in 1876, when the Centennial Exposition then in progress, was an additional powerful inducement for the members to arrange their business affairs for a prolonged absence from home; but it was likewise quite productive in the presentation of important papers and in discussions on practical and scientific subjects, as will be seen by a perusal of the condensed report of the proceedings and of the papers which we publish in full or in abstract in this number.

One of the most gratifying exhibits, to accomplish which the officers have been assiduously laboring in the past, was the financial statement, showing not only a cash balance on hand of more than double the amount than could be presented at any previous meeting, but in addition thereto nearly $3,000 permanently invested for general or special purposes. Aside from the honest performance by the elective officers and committees of their assumed duties, this result is due to the promptness with which nearly all the members responded to the Treasurer's call, and to the faithfulness with which the authorized agents attended to the sometimes unpleasant duty of dunning the tardy ones for the just dues. The life membership fund has in four years nearly reached $1,000; after this good beginning, it is to be hoped that it will grow more rapidly, so that the object of such a fund may soon be attained, of reducing the annual dues to so low a figure that no pharmacist need be debarred, for pecuniary reasons, from enjoying all the advantages of the organization and its annual publications.

During a long series of years it has happened for the first time that the weather was unpropitious to such an extent that much of the planned relaxation had to be abandoned. Still, considering the work done, the unfavorable state of the weather enabled those present to do better justice to the intellectual treats offered to them. A year ago the holding of one session each day was inaugurated; this year it was abandoned through the

force of circumstances, and time did not hang heavily on the meeting during the four days. The lesson taught should be heeded in the future, and it is twofold In the first place the work should commence early in the day and should be prosecuted in good earnest. Then side issues and matters of little or no importance for the aims and objects of the Association, if they cannot be at once disposed of, may very properly be referred to a committee or to the Council for previous consideration. The Association did make a good beginning in this respect, and, if that line be followed in the future, each meeting will become more profitable as far as observations and investigations on matters of pharmaceutical interest are concerned; but there will likewise be ample room for such social enjoyment as will make these meetings the annual gatherings of staunch friends from all quarters of this continent.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Proceedings of the Second Annual Meeting of the Virginia State Pharmaceutical Association, held in Norfolk, May 15th, 16th and 17th, 1883. Also proposed pharmacy bill, constitution, by-laws and roll of members. Petersburg, Va. 8vo, pp. 81.

Reference to this meeting was made on page 334 of this Journal. The officers are C. A. Santos, Norfolk, President; Hugh Blair, Richmond, C. B. Fleet, Lynchburg, E. Warfield, Alexandria, A. Buff, Portsmouth, Vice Presidents; E. R. Beckwith, Petersburg, Secretary; F. H. Masi, Norfolk, Treasurer; T. Roberts Baker, Richmond, Corresponding Secretary, and Chas. H. Lumsden, Lynchburg, Local Secretary.

Twelfth Annual Report of the Alumni Association of the College of Pharmacy of the City of New York, 1883. 8vo, pp. 68.

The pamphlet contains addresses, reports, commencement exercises, etc.

The Roller Bandage. By Wm. B. Hopkins, M. D., Surgeon to the Outdepartments of Pennsylvania, Episcopal and University Hospitals, etc. Philadelphia: J. B. Lippincott & Co., 1883. 12mo, pp, 95. Price, $1.25.

This little work describes the ordinary roller bandage, the manner in which it is made and the methods of applying it to various parts of the body. These descriptions are rendered very plain and instructive by 73 illustrations, which were drawn from photographs taken from a living model on whom the different applications of the bandage were made. These illustrations therefore teach or explain the different methods fully as well if not better than elaborate descriptions. The only material mentioned for making the roller bandage is muslin; it would seem therefore that the elastic bandage woven like hosiery, which is extensively used in Europe and which was briefly noticed in this Journal, 1880, p. 581, is little if at all used in this country.